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Analyses of stone
FARRINGTON
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ANALYSES OF STONE METEORITES

COMPILED AND CLASSIFIED
BY

OLIVER CUMMINGS FARRINGTON
Curator, Department of Geology

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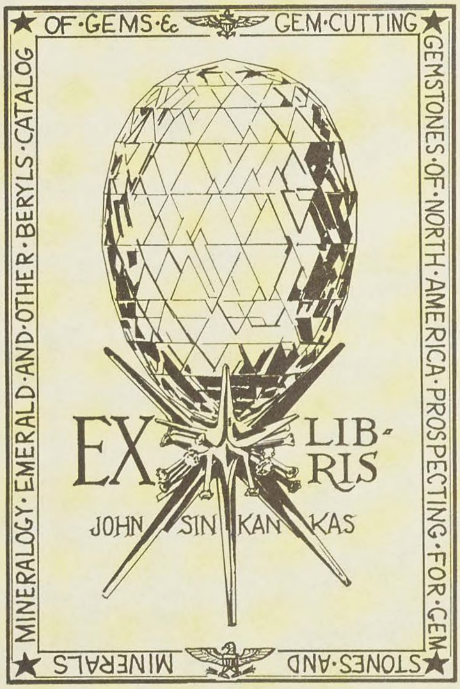
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The object of this publication is twofold: (1) To give a compilation of analyses of stone meteorites of the same nature as that already made by the author for iron meteorites.* (2) To use these analyses as a basis for the establishment of a quantitative classification. The plan on which the analyses have been collected for the first purpose has already been described in the introduction to the paper on Analyses of Iron Meteorites. The need of such a collection is due to the fact that as with the iron meteorites, the last extensive compilation of analyses of stone meteorites which was published was that of Wadsworth in 1884.† Since Wadsworth's compilation a number of excellent analyses have been made both of meteorites which have fallen since that time and of earlier ones, and the convenience of having these analyses grouped together for purposes of reference is obvious. The chief difference between the collection by the present writer of the analyses of the stone meteorites and that of the iron meteorites is that a more rigid selection of the analyses of the stone meteorites has been made. Only those analyses which gave satisfactory evidence of being thorough and complete have been admitted to the list. On the other hand tolerance has been exercised in the admission of analyses which might on the whole be complete although obviously containing minor errors. The greatest difficulty which has been encountered in including analyses in the collection has been that of obtaining mass analyses. It has been a common tendency of analysts of stone meteorites to give only analyses of separate portions. In order to combine the analyses of the separate portions into a mass analysis a reduction of all results to 100 is, of course, necessary. The results thus obtained probably often fail to accurately represent all the constituents of the meteorite, but on the

* Analyses of Iron Meteorites Compiled and Classified, Field Col. Mus. Pub. 1907, Geol. Ser., Vol. 3, pp. 59–110.

† Rocks of the Cordilleras; Mem. Mus. Comp. Zool. Cambridge, Mass., 1884, Vol. II, pt. 1, pp. XVI–XXXIII.

whole no serious error need be involved. To confine reported analyses to those which were only stated in the mass form would reduce the number materially and fail to represent our true knowledge of the chemical composition of meteorites.

The second purpose for which the grouping of the analyses has been made was, as has been stated, to propose a quantitative classification. The principles of this classification are the same as those for terrestrial rocks proposed by Cross, Iddings, Pirsson, and Washington.* It was suggested by Washington in his publication on the Chemical Analyses of Igneous Rocks and their Classification† that such a classification of meteorites be made, and the writer held a brief conference with Dr. Washington on the subject. The need of such a classification of meteorites is, perhaps, even more acute than was the case with terrestrial rocks. Of the various classifications of meteorites which have been proposed none can be considered quantitative. The classification chiefly used for stone meteorites at the present time is that which has been gradually evolved through the labors of Rose, Tschermak, Cohen, and Brezina. It is presented in its most complete form by Brezina in the Catalogue of the Ward-Coonley Collection of Meteorites.‡ As is well known, the groups of this classification are based primarily upon structure but also upon mineralogical characters. The stones are first subdivided into achondrites, chondrites, and siderolites. The achondrites are divided into a number of groups distinguished by mineralogical composition. These include the eukrites, chladnites, howardites, etc. Among the chondrites the subdivisions are based chiefly on color, the groups being designated as white, gray, black, intermediate, carbonaceous, etc., with additional divisions according to structure giving spherulitic and crystalline. Other subdivisions are based upon the presence or absence of veins and breccia-like structure. Of these divisions, that according to color cannot be regarded as resting upon any important or fundamental character, although it finds some slight justification in the fact that the lighter-colored meteorites are likely to contain more enstatite than the darker ones. Another weak feature of the classification in the view of the present writer is its failure to take account, in any definite way, of the metallic content of meteorites. The metal of meteorites is an important feature which should serve as a distinguishing mark.

So far as the iron meteorites are concerned the present system of

* Quantitative Classification of Igneous Rocks, Chicago, 1903.
† U. S. Geological Survey, 1903, Prof. Pap. No. 14, pp. 9 and 61.
‡ Henry A. Ward, Chicago, 1904, pp. 97–101.

Brezina is quantitative, as the present writer has shown.* The metallic content of the stone meteorites, however, finds little recognition in the Brezina system.

It will be obvious that some modification of the Quantitative Classification of terrestrial rocks is necessary in order to fit it for use with meteorites. Among these one is due to the impossibility of using regional names for the nomenclature of orders, sections, etc., of meteorites. For this reason in designation of the subdivisions the writer has used only descriptive adjectives. A group name is given only to the last group, the subrang. This name is that of a meteorite as nearly representative in composition as possible, preference being given, where there is a choice of names, to the better known meteorites. Another modification of classification necessary has been on account of the abundance of metal in meteorites. This required the formation of several subclasses in the classes in which among terrestrial rocks but a single subclass exists. Two subclasses are thus required in Class IV and four in Class V. As no nomenclature was proposed by the authors of the Quantitative Classification which would be applicable to more than one subclass, it has been necessary for the writer to provide names for the additional subclasses. This has been done by coining adjective terms indicating the relative quantities of silicates and metal. The adjectives for the five subdivisions are: persilicic, dosilicic, silico-metallic, dometallic, and permetallic. As will be noted by consulting the tables, most meteorites fall outside of the groups of terrestrial rocks. The following groups are similar in meteorites and terrestrial rocks: Kedabdekase of terrestrial rocks corresponds to Juvinose of meteorites; Wehrlose to Udenose; Argeinose to Stawropolose; Maricose to Bishopvillose; and Websterose to Bustose. Some minerals not found in terrestrial rocks occur in meteorites. To these the writer has given the following abbreviations: troilite, *tr;* oldhamite, *oh;* nickel-iron, *nf*. As it is occasionally necessary to assume the presence of the molecule (Mg, Fe)O in meteorites, the name *femite* and abbreviation *mo* are proposed for it. The standard minerals assumed to be present in meteorites and their abbreviations are then as follows:

GROUP I: SALIC MINERALS

Quartz, SiO_2		Q
Zircon, $ZrO_2 . SiO_2$		Z
Orthoclase, $K_2O . Al_2O_3 . 6 SiO_2$	or	F
Albite, $Na_2O . Al_2O_3 . 6 SiO_2$	ab	F
Anorthite, $CaO . Al_2O_3 . 2 SiO_2$	an	F

* Field Col. Mus. Pub. 1907, Geol. Ser., Vol. 3, p. 108.

Leucite, $K_2O \cdot Al_2O_3 \cdot 4\,SiO_2$	lc		
Nephelite, $Na_2O \cdot Al_2O_3 \cdot 2\,SiO_2$	ne	L	
Kaliophilite, $K_2O \cdot Al_3O_2\ 2\,SiO_2$	kp		

GROUP II: FEMIC MINERALS

Acmite, $Na_2O \cdot Fe_2O_3 \cdot 4\,SiO_2$	ac		
Sodium metasilicate, $Na_2O \cdot SiO_2$	ns		
Potassium metasilicate, $K_2O \cdot SiO_2$	ks		
Diopside, $CaO \cdot (Mg, Fe)O \cdot 2\,SiO_2$	di	P	
Wollastonite, $CaO \cdot SiO_2$	wo		
Hypersthene, $(Mg, Fe)O \cdot SiO_2$	hy		
Olivine, $2\,(Mg, Fe)O \cdot SiO_2$	ol	O	
Akermanite, $4\,CaO \cdot 3\,SiO_2$	am		
Magnetite, $FeO \cdot Fe_2O_3$	mt		
Femite, Mg, FeO	mo		
Chromite, $FeO \cdot Cr_2O_3$	om	H	
Hematite, Fe_2O_3	hm		M
Ilmenite, $FeO \cdot TiO_2$	il	T	
Apatite, $3\,(3\,CaO \cdot P_2O_5) \cdot CaF_2$	ap		
Troilite, FeS	tr		
Oldhamite, CaS	oh	A	
Schreibersite, $(Fe, Ni)_3P$	sc		
Nickel-iron, Fe_n, Ni_m	nf		

The methods of calculating the analyses of meteorites in order to determine their place in this classification are the same as those adopted for terrestrial rocks by the authors of the Quantitative Classification. These are given in detail in their publication. As it may be convenient, however, to have the quantitative classification of meteorites so far as possible complete in itself, so much of the methods of calculation as is deemed necessary is here repeated from the work of the authors of the Quantitative Classification.*

1. Determine the molecular proportions of the chemical components of a rock as expressed by the complete analysis, by dividing the percentage weights of each component by its molecular weight.

2. Before undertaking the distribution of the chemical components as mineral molecules, small amounts of MnO and NiO are to be united with FeO, and of BaO and SrO with CaO; of Cr_2O_3 with Fe_2O_3, unless these unusual components occur in sufficient amounts to make their calculation as special mineral molecules desirable.

3. Establish the fixed molecules by allotting:

a) to Cr_2O_3, if present in notable amount, FeO to satisfy the ratio $Cr_2O_3 : FeO :: 1 : 1$ for chromite:

b) to TiO_2 enough FeO to satisfy the ratio $TiO_2 : FeO :: 1 : 1$ for ilmenite. If there is excess of TiO_2, allot to it equal CaO for titanite or perofskite according to available silica, to be determined later. If there is an excess of TiO_2 it is to be calculated as rutile.

* *Loc. cit.* pp. 188–195.

c) to P_2O_5 allot enough CaO to satisfy the ratio $P_2O_5 : CaO :: 1 : 3.33$ for apatite. Allot F or Cl to satisfy $CaO = 0.33\ P_2O_5$;

d) to F not used in apatite allot CaO to form fluorite, $CaO : F :: 1 : 2$;

e) to Cl allot Na_2O in the ratio $Cl_2 : Na_2(O) :: 1 : 1$ for sodalite;

f) to SO_3 allot Na_2O in proportion $SO_3 : Na_2O :: 1 : 1$ for noselite;

g) to S allot FeO in proportion $S : Fe(O) :: 2 : 1$ for pyrite;

h) to CO_2 in undecomposed rocks allot CaO in the proportion $1 : 1$ for calcite. CO_2 may occur in primary calcite and cancrinite. If these minerals are secondary, the CO_2 is to be neglected, since it is understood that analyses of decomposed rocks are not available for purposes of classification.

Having adjusted the minor, inflexible, molecules, there remain the more important but variable silicate molecules, which form the great part of the mineral composition, or *norm*, of most rocks.

4. To Al_2O_3 are allotted all the K_2O and Na_2O not already disposed of, in the proportion of $Al_2O_3 : K_2O + Na_2O :: 1 : 1$ for alkali feldspathic and feldspathoid (lenad) molecules.

5. With excess of Al_2O_3, ($Al_2O_3 > K_2O + Na_2O$);

a) to extra Al_2O_3 allot CaO in proportion of $Al_2O_3 : CaO :: 1 : 1$ for anorthite molecules.

b) If there is further excess of Al_2O_3 it is to be considered as corundum, Al_2O_3.

6. With insufficient Al_2O_3, ($Al_2O_3 < K_2O + Na_2O$);

a) Extra Na_2O is alloted to Fe_2O_3 in proportion $Fe_2O_3 : Na_2O :: 1 : 1$ for acmite molecules.

b) If there is still extra Na_2O it is set aside for a metasilicate molecule (Na_2SiO_3).

c) When there is an excess of K_2O over Al_2O_3 it is treated in the same manner. It is an extremely rare occurrence.

7. In working with reliable analyses in which Fe_2O_3 and FeO have been correctly determined:

a) To Fe_2O_3 is allotted excess of Na_2O under conditions 6, *a*).

b) To remaining Fe_2O_3 is allotted available FeO in equal proportions for magnetite.

c) If there is any excess of Fe_2O_3 it is calculated as hematite.

Analyses in which all the iron has been determined in one form of oxidation, when it occurs in two, are of little value when considerable iron is present. When the amount of iron is very small the analyses may still be used as a means of classifying the rock. For this purpose all the iron, if given as ferric oxide, is to be calculated as FeO, except that necessary to be allotted to Na_2O for acmite, and then used as below.

8. *a*) Extra CaO after the foregoing assignments is allotted to $(Mg, Fe)O$ in proportion $CaO : (Mg, Fe)O :: 1 : 1$ for diopside molecules.

In all molecules where $(Mg, Fe)O$ is present, MgO and FeO are to be used in the same proportions in which they are found after FeO has been allotted to the molecules previously mentioned. That is, they are to be introduced into diopside, hypersthene, and olivine with the same ratio between them.

b) If there is still an excess of CaO it is to be set aside for calcium metasilicate ($CaSiO_3$) or subsilicate ($4\ CaO . 3\ SiO_2$), equivalent to wollastonite or akermanite. Such extra CaO will in most cases actually enter garnet, an alferric mineral.

9. With insufficient CaO, ($CaO < (Mg, Fe)O$);

a) Extra $(Mg, Fe)O$ is to be set aside for metasilicate or orthosilicate, hypersthene or olivine, according to the amount of SiO_2 present.

The allotment of $Si\ O_2$ to form silicates begins with the bases which occur with silica in but one proportion, and is carried on as follows:

10. To $Zr\ O_2$ allot $Si\ O_2$ in proportion of 1 : 1 for zircon.

11. To $Ca\ O$ and $Al_2\ O_3$ in anorthite is allotted equal $Si\ O_2$ to form $Ca\ O.Al_2\ O_3.2\ Si\ O_2$.

12. To $Ca\ O$ and $(Mg, Fe)\ O$ in diopside is allotted equal $Si\ O_2$ to form $Ca\ O.(Mg, Fe)\ O.2\ Si\ O_2$.

13. To $Na_2\ O$ and $Fe_2\ O_3$ in acmite is allotted $Si\ O_2$ to form $Na_2\ O.Fe_2\ O_3.4\ Si\ O_2$.

14. To $Na_2\ O$ (or $K_2\ O$) set aside for metasilicate molecules allot $Si\ O_2$ to form $Na_2\ O.Si\ O_2$ or $K_2\ O.Si\ O_2$.

15. To $Na_2\ O$ and $Al_2\ O_3$ in sufficient amount to form with $Na\ Cl$ sodalite, or with $Na_2\ SO_4$ noselite, is allotted $Si\ O_2$ to satisfy the formulas : $3\ (Na_2\ O.Al_2\ O_3\ 2Si\ O_2).2\ Na\ Cl$, sodalite, $2\ (Na_2\ O.Al_2\ O_3.2\ Si\ O_2).Na_2\ SO_4$ noselite.

16. To $Ca\ O$ set aside for wollastonite or akermanite is allotted tentatively $Si\ O_2$ to form wollastonite ($Ca\ O.Si\ O_2$).

17. To extra $(Mg, Fe)\ O$ is allotted $Si\ O_2$ to form orthosilicate, olivine ($2\ (Mg, Fe)\ O.Si\ O_2$).

18. To $Al_2\ O_3$ and $K_2\ O + Na_2\ O$ is allotted $Si\ O_2$ to make the polysilicates, orthoclase and albite, $K_2\ O.Al_2\ O_3.6\ Si\ O_2$ and $Na_2\ O.\ Al_2\ O_3.6\ Si\ O_2$.

a) If there is an excess of $Si\ O_2$ it is added to the orthosilicate of $(Mg, Fe)\ O$ to raise it to the metasilicate $(Mg, Fe)\ O.Si\ O_2$. If $Si\ O_2$ is insufficient to convert all the olivine into hypersthene it is distributed according to the following equations:

$$x + y = \text{molecules of } (Mg, Fe)\ O.$$

$$x + \frac{y}{2} = \text{available } Si\ O_2.$$

where x = hypersthene, $\frac{y}{2}$ = olivine molecules.

b) Further excess of $Si\ O_2$ is to be allotted to $Ti\ O_2$ and $Ca\ O$ to form titanite. These constituents remain as perofskite when there is no excess of $Si\ O_2$.

c) Further excess of $Si\ O_2$ is reckoned as quartz.

19. If there is insufficient $Si\ O_2$ to form polysilicate feldspar out of all the $K_2\ O$ and $Na_2\ O$ with $Al_2\ O_3$:

a) To $K_2\ O.Al_2\ O_3$ is allotted tentatively enough $Si\ O_2$ to form polysilicate, orthoclase ($K_2\ O.Al_2\ O_3.6\ Si\ O_2$) and the remaining $Si\ O_2$ is distributed between albite and nephelite molecules by means of the equations:

$$x + y = \text{molecules of } Na_2\ O.$$
$$6x + 2y = \text{available } Si\ O_2.$$

where x = albite, and y = nephelite molecules.

b) If the available $Si\ O_2$ in case 15, *a*) is insufficient to form nephelite with the $Na_2\ O$, then enough $Si\ O_2$ is first allotted to the $Na_2\ O$ to form nephelite and the remaining $Si\ O_2$ is distributed between orthoclase and leucite molecules by means of the equations:

$$x + y = \text{molecules of } K_2\ O.$$
$$6x + 4y = \text{available } Si\ O_2.$$

where x = orthoclase, and y = leucite molecules.

20. If there is insufficient $Si\ O_2$ to form leucite and nephelite with olivine it is necessary to reduce a sufficient number of molecules to form the subsilicate akermanite, $4Ca\ O.3\ Si\ O_2$.

a) In case there is no wollastonite this is done after distributing $Si\,O_2$ tentatively to form leucite, nephelite, and olivine, and noting the deficit of $Si\,O_2$ by means of the equation:

$$y = \frac{1}{3} \text{ of the deficit of } Si\,O_2.$$
$$y = \text{molecules of akermanite.} \quad (4\,Ca\,O.3\,Si\,O_2).$$

Ca O is to be taken from diopside, and the Mg O and Fe O so liberated are to be calculated as olivine.

b) In case an excess of Ca O has been set aside for wollastonite this is first converted to akermanite by means of the equations:

$$y = \text{the deficit of } Si\,O_2.$$
$$y = \text{molecules of akermanite } (4\,Ca\,O.3\,Si\,O_2).$$

c) If there are not sufficient molecules of wollastonite to satisfy the deficit of silica, recalculate the molecules of diopside and wollastonite so as to make olivine, diopside, and akermanite by means of the formulæ:

$$2x + 3y + \frac{z}{2} = \text{available } Si\,O_2.$$
$$x + 4y = \text{molecules of } Ca\,O.$$
$$x + z = \text{molecules of } Mg\,O + Fe\,O.$$

where x = molecules of new diopside, y = molecules of akermanite ($4\,Ca\,O.3\,Si\,O_2$), and z = molecules of olivine.

21. If there is still not enough $Si\,O_2$, all the Ca O of the diopside and wollastonite must be calculated as akermanite, the (Mg, Fe) O being reckoned as olivine and the $K_2\,O$ distributed between leucite and kaliophilite by the equations:

$$x + y = \text{molecules of } K_2\,O.$$
$$4x + 2y = \text{available } Si\,O_2.$$

where x is $K_2\,O$ in leucite and $y = K_2\,O$ in kaliophilite.

22. In case there is insufficient $Si\,O_2$ and an excess of $Al_2\,O_3$ and (Mg, Fe) O, which might form aluminum spinel, an alferric mineral, the excess of $Al_2\,O_3$ is to be calculated as corundum, and the uncombined (Mg, Fe) O is to be estimated as femic minerals, being placed with the nonsilicate, mitic group, magnetite, ilmenite, etc.

GLOSSARY

A

Alkalicalcic. Having salic alkalies and salic lime present in equal or nearly equal amounts. $\frac{K_2O' + Na_2O'}{CaO'} < \frac{5}{3} > \frac{3}{5}$.

C

Calcimiric. Equally calcic and miric, or nearly so. $\frac{MgO + FeO}{CaO} < \frac{5}{3} > \frac{3}{5}$.

Class. Division of igneous rocks based on the relative proportions of salic and femic standard minerals.

D

Do- (or dom) Prefix indicating that one factor dominates over another within the ratios $\frac{7}{1}$ and $\frac{5}{3}$.

Docalcic. Dominantly calcic. Of salic minerals when CaO' dominates over $K_2O' + Na_2O'$. $\frac{K_2O' + Na_2O'}{CaO'} < \frac{3}{5} > \frac{1}{7}$. Of femic minerals when CaO'' dominates over $MgO + FeO$. $\frac{MgO + FeO}{CaO''} < \frac{3}{5} > \frac{1}{7}$.

Dofelic. Dominantly felic, having normative feldspar dominant over normative quartz or lenads. $\frac{Q \text{ or } L}{F} < \frac{3}{5} > \frac{1}{7}$.

Dofemane. Class IV of igneous rocks, having femic minerals dominant over salic.

$$\frac{Sal}{Fem} < \frac{3}{5} > \frac{1}{7}.$$

Dofemic. Dominantly femic, having femic minerals dominant over salic.

$$\frac{Sal}{Fem} < \frac{3}{5} > \frac{1}{7}.$$

Doferrous. Dominantly ferrous, having FeO dominant over MgO.

$$\frac{MgO}{FeO} < \frac{3}{5} > \frac{1}{7}.$$

Domagnesic. Dominantly magnesic, having MgO dominant over FeO.

$$\frac{MgO}{FeO} < \frac{7}{1} > \frac{5}{3}.$$

Domalkalic. Dominantly alkalic; of salic minerals when $K_2O' + Na_2O'$ dominates over CaO'. $\frac{K_2O' + Na_2O'}{CaO'} < \frac{7}{1} > \frac{5}{3}$. Of femic minerals when $K_2O'' + Na_2O''$ dominates over $MgO + FeO + CaO''$.

$$\frac{MgO + FeO + CaO''}{K_2O'' + Na_2O''} < \frac{3}{5} > \frac{1}{7}.$$

Domiric. Dominantly miric, having Mg O + Fe O dominant over Ca O''.

$$\frac{Mg\,O + Fe\,O}{Ca\,O''} < \frac{7}{1} > \frac{5}{3}.$$

Domirlic. Dominantly mirlic, having Mg O + Fe O + Ca O'' dominant over $K_2\,O'' + Na_2\,O''$. $\frac{Mg\,O + Fe\,O + Ca\,O''}{K_2\,O + Na_2\,O''} < \frac{7}{1} > \frac{5}{3}$.

Domitic. Dominantly mitic, having mitic minerals (magnetite, hematite, ilmenite, titanite, etc.) dominant over polic minerals (pyroxene, olivine, akermanite).

$$\frac{P\,O}{M} < \frac{3}{5} > \frac{1}{7}.$$

Domolic. Dominantly olic, having normative olivine and akermanite dominant over normative pyroxenes. $\frac{P}{O} < \frac{3}{5} > \frac{1}{7}$.

Dopolic. Dominantly polic, having polic minerals (pyroxene, olivine) dominant over mitic minerals (magnetite, ilmenite, etc.). $\frac{P\,O}{M} < \frac{7}{1} > \frac{5}{3}$.

Dopotassic. Dominantly potassic, having $K_2\,O$ dominant over $Na_2\,O$.

$$\frac{K_2\,O}{Na_2\,O} < \frac{7}{1} > \frac{5}{3}.$$

Dopyric. Dominantly pyric, having normative pyroxene dominant over normative olivine and akermanite. $\frac{P}{O} < \frac{7}{1} > \frac{5}{3}$.

Doquaric. Dominantly quaric, having normative quartz dominant over normative feldspar. $\frac{Q}{F} < \frac{7}{1} > \frac{5}{3}$.

Dosalic. Dominantly salic, having the salic minerals dominant over the femic.

$$\frac{Sal}{Fem} < \frac{7}{1} > \frac{5}{3}.$$

Dosodic. Dominantly sodic, having $Na_2\,O$ dominant over $K_2\,O$.

$$\frac{K_2\,O}{Na_2\,O} < \frac{3}{5} > \frac{1}{7}.$$

E

Extreme. Said of a factor that is present alone or in amount greater than 7:1 of the other factor.

F

Felic. Having the properties of, or containing, the feldspars.

Fem. Term mnemonic of the second group of standard minerals, including non-aluminous ferromagnesian and calcic silicates, silicotitanates and non-siliceous and non-aluminous minerals.

Femic. Having the character of, or belonging to, the second (fem) group of standard minerals.

L

Len. Syllable mnemonic of leucite and nephelite, including sodalite and noselite, the feldspathoids.

Lenad. One of the standard minerals, leucite, nephelite, sodalite or noselite.

M

Magnesiferrous. Equally magnesic and ferrous, or nearly so.

$$\frac{Mg\,O}{Fe\,O} < \frac{5}{3} > \frac{3}{5}.$$

Mir. Syllable mnemonic of magnesia and ferrous iron.

Miric. Characterized by presence of Mg O and Fe O.

Mirl. Syllable mnemonic of magnesia, ferrous iron, and lime.

Mirlic. Characterized by presence of Mg O, Fe O, and Ca O.

Mit. Syllable mnemonic of magnetite, ilmenite, and titanite, and including all minerals of the second subgroup of femic minerals.

Mitic. Adjective referring to the above mentioned minerals.

Mode. The actual mineral composition of a rock. Opposed to norm, with which it may or may not coincide.

O

Ol. Syllable mnemonic of olivine, embracing also akermanite.

Olic. Having the proportions of, or containing, normative olivine or akermanite.

Order. A division of Subclass based on the relative proportions of the standard mineral subgroups in the preponderant group.

P

Per- Prefix to indicate that a factor is present alone, or in extreme amount; that is, its ratio to another factor is $> \frac{7}{1}$.

Peralkalic. Extremely alkalic. Of salic minerals when $K_2\,O' + Na_2\,O'$ is more than seven times $Ca\,O'$. $\frac{K_2\,O' + Na_2\,O'}{Ca\,O'} > \frac{7}{1}$. Of femic minerals when $K_2\,O'' + Na_2\,O''$ is more than seven times $Mg\,O + Fe\,O + Ca\,O''$.

$$\frac{Mg\,O + Fe\,O + Ca\,O''}{K_2\,O'' + Na_2\,O''} < \frac{1}{7}.$$

Percalcic. Extremely calcic. Of salic minerals when $Ca\,O'$ is more than seven times $K_2\,O' + Na_2\,O'$. $\frac{K_2\,O' + Na_2\,O'}{Ca\,O'} < \frac{1}{7}$. Of femic minerals when $Ca\,O''$ is more than seven times $Mg\,O + Fe\,O$. $\frac{Mg\,O + Fe\,O}{Ca\,O''} < \frac{1}{7}$.

Perfelic. Extremely felic. When normative feldspar is more than seven times the normative quartz or lenads. $\frac{Q \text{ or } L}{F} < \frac{1}{7}$.

Perfemane. Class V of igneous rocks, having femic minerals extremely abundant.

$$\frac{Sal}{Fem} < \frac{1}{7}.$$

Perfemic. Extremely femic. Having femic minerals more than seven times the salic.

$$\frac{Sal}{Fem} < \frac{1}{7}.$$

Perferrous. Extremely ferrous. When Fe O is more than seven times Mg O.

$$\frac{Mg\,O}{Fe\,O} < \frac{1}{7}.$$

Permagnesic. Extremely magnesic; having Mg O more than seven times Fe O.

$$\frac{\text{Mg O}}{\text{Fe O}} > \frac{7}{1}.$$

Permiric. Extremely miric; having Mg O + Fe O more than seven times Ca O″.

$$\frac{\text{Mg O} + \text{Fe O}}{\text{Ca O}''} > \frac{7}{1}.$$

Permirlic. Extremely mirlic; having Mg O + Fe O + Ca O″ more than seven times K_2 O″ + Na_2 O″. $\frac{\text{Mg O} + \text{Fe O} + \text{Ca O}''}{K_2\text{O}'' + Na_2\text{O}''} > \frac{7}{1}.$

Perolic. Extremely olic; having olic minerals (olivine, akermanite) more than seven times the pyric minerals (pyroxenes). $\frac{P}{O} < \frac{1}{7}.$

Perpolic. Extremely polic, having polic minerals (pyroxenes, olivine, akermanite) more than seven times the mitic minerals (magnetite, ilmenite, titanite, hematite, etc.). $\frac{PO}{M} > \frac{7}{1}.$

Perpotassic. Extremely potassic, having K_2 O′ more than seven times Na_2 O′.

$$\frac{K_2\text{O}'}{Na_2\text{O}'} > \frac{7}{1}.$$

Perpyric. Extremely pyric, having pyric minerals (pyroxenes) more than seven times the olic minerals (olivine, akermanite). $\frac{P}{O} > \frac{7}{1}.$

Perquarfelic. Extremely quarfellenic; having normative quartz, feldspar, and feldspathoids more than seven times corundum and zircon. $\frac{QFL}{CZ} > \frac{7}{1}.$

Perquaric. Extremely quaric; having normative quartz more than seven times the normative feldspar. $\frac{Q}{F} > \frac{7}{1}.$

Pol. Syllable mnemonic of the femic silicates pyroxenes and olivine, including akermanite.

Polic. Characterized by the presence of the femic silicates.

Polmitic. Having equal or nearly equal amounts of polic and mitic minerals.

$$\frac{PO}{M} < \frac{5}{3} > \frac{3}{5}.$$

Pyr. Syllable mnemonic of pyroxenes.

Pyrolic. Having equal, or nearly equal amounts of normative pyroxene and olivine or akermanite. $\frac{P}{O} < \frac{5}{3} > \frac{3}{5}.$

Q

Quar. Syllable mnemonic of quartz.

Quardofelic. Having felic minerals (feldspar) dominant over normative quartz.

$$\frac{Q}{F} < \frac{7}{1} > \frac{5}{3}.$$

Quarfelic. Having equal or nearly equal amounts of normative quartz and feldspars.

$$\frac{Q}{F} < \frac{5}{3} > \frac{3}{5}.$$

R

Rang. (Old form of rank.) Division of Order based on the character of the chemical bases in the preponderant group of standard minerals.

S

Sal. Syllable mnemonic of the silico-aluminous non-ferromagnesian group of standard minerals, including quartz, feldspars, lenads, corundum and zircon.

Salfemane. Class III of igneous rocks; having salic and femic minerals in equal or nearly equal proportions. $\frac{\text{Sal}}{\text{Fem}} < \frac{5}{3} > \frac{3}{5}$.

Salfemic. Having salic and femic minerals in equal or nearly equal amounts.

$$\frac{\text{Sal}}{\text{Fem}} < \frac{5}{3} > \frac{3}{5}.$$

Salic. Having the characters of, or belonging to, the first (sal) group of standard minerals.

Section. Subdivision of any of the other taxonomic divisions from Class to Subgrad.

Subrang. Division of Rang, based on the character of the chemical bases in the preponderant mineral subgroup used in forming Rang.

In order to still further indicate the manner in which the calculations upon which the place of each meteorite in the classification is based are made, two examples of such calculations are here given. The first illustrates the calculation of the mineral components which characterize the great majority of the stony meteorites, the analysis chosen for the calculation being one of the Allegan meteorite made by Stokes.

In the second example is shown the manner of adjusting silica among the different minerals after a preliminary calculation has indicated that too little silica is present to form the more highly siliceous ones. The analysis is one of Felix made by Fireman.

EXAMPLE I

ALLEGAN

Proc. Washington Acad. Sci. 1900, 2, 51

	Per Cent.	Mol.	Apat.	Ilm.	Chrom.	Orth.	Alb.	An.	Diop.	Rem'der.	Hyp.	Oliv.
$Si\,O_2$	34.95	583	..	..	..	12	66	24	22	459	262	197
$Al_2\,O_3$	2.55	25	..	..	..	2	11	12	..	..	..	..
$Cr_2\,O_3$	.53	3	..	..	3	..	..	..	..	..	..	..
Fe O	8.47	118	..	1	3	..	..	..				
Mn O	.18	3	..	..	..	..	..	..	11	656	262	394
Mg O......	21.99	550	..	..	..	..	..	..				
Ca O......	1.73	30	7	..	..	..	..	12	11	..	..	..
$Na_2\,O$	.66	11	..	..	..	..	11	..	..	..	..	..
$K_2\,O$	.23	2	..	..	..	2	..	..	..	..	..	..
$H_2\,O$	.25	..	..	..	..	..	..	..	..	..	..	..
$Ti\,O_2$	.08	1	..	1	..	..	..	..	..	..	..	..
Fe	21.09	..	..	..	..	..	..	..	..	..	..	..
Ni	1.81	..	..	..	..	..	..	..	..	..	..	..
Co	.05	..	..	..	..	..	..	..	..	..	..	..
Cu	.01	..	..	..	..	..	..	..	..	..	..	..
Fe S.......	5.05	..	..	..	..	..	..	..	..	..	..	..
$P_2\,O_5$	.27	2	2	..	..	..	..	..	..	..	..	..
Sum.......	100.00	..	..	..	..	..	..	..	..	..	..	..

$$x + y = 656\ \text{(Mg. Fe) O}$$

$$x + \frac{y}{2} = 459\ Si\,O_2$$

$$x = 262$$

$$y = 394$$

Formula	Mol. Wt.		Norm			
$K_2\,O.Al_2\,O_3.6\,Si\,O_2$ ..	2 × 556	= orthoclase	= 1.11	F 10.21	Sal 10.21.	
$Na_2\,O.Al_2\,O_3.6\,Si\,O_2$.	11 × 524	= albite	= 5.76			
$Ca\,O.Al_2\,O_3.2\,Si\,O_2$..	12 × 278	= anorthite	= 3.34			
$Ca\,O.Si\,O_2$.......	11 × 116	= diopside	= 2.44	P 30.11	P+O 59.90	Fem 89.45
$Mg\,O.Si\,O_2$......	9 × 100					
$Fe\,O.Si\,O_2$.......	2 × 132					
$Mg\,O.Si\,O_2$......216	× 100	= hypersthene	= 27.67			
$Fe\,O.Si\,O_2$....... 46	× 132					
$2\,Mg\,O.Si\,O_2$.....325	× 70	= olivine	= 29.79	O		
$2\,Fe\,O.Si\,O_2$...... 69	× 102					
$Fe\,O.Cr_2\,O_3$........	3 × 224	= chromite	= .67	M	.82	
$Fe\,O.\ Ti\,O_2$........	1 × 152	= ilmenite	= .15			
$3\,Ca\,O.P_2\,O_5$.......	2 × 310	= apatite	= .62	A	28.73	
Fe S..............		= troilite	= 5.05			
$Fe_n\,Ni_m$...........		= nickel-iron	= 23.06			
			99.66			

Perfemic, Dosilicic, Perpolic, Pyrolic

$$\frac{\text{Sal}}{\text{Fem}} = \frac{10.21}{89.45} < \frac{1}{7}, \quad \frac{\text{POM}}{\text{A}} = \frac{60.72}{28.73} < \frac{7}{1} > \frac{5}{3}, \quad \frac{\text{PO}}{\text{M}} = \frac{59.90}{.82} > \frac{7}{1}, \quad \frac{\text{P}}{\text{O}} = \frac{30.11}{29.79} < \frac{5}{3} > \frac{3}{5}$$

Permirlic, Permiric, Domagnesic

$$\frac{Ca\,O + Mg\,O + Fe\,O}{Na_2\,O} = \frac{690}{11} > \frac{7}{1}, \quad \frac{Mg\,O + Fe\,O}{Ca\,O} = \frac{667}{23} > \frac{7}{1}, \quad \frac{Mg\,O}{Fe\,O} = \frac{550}{117} < \frac{7}{1} > \frac{5}{3}$$

EXAMPLE II

FELIX

Proc. U. S. Nat. Mus. 1901, 24, 197

	Per Cent.	Mol.	Chromite	Leuc.	Nep.	An.	Tentative Diop.	Tentative Oliv.	Deficit	Ak.	Final Diop.	Final Olv.
SiO_2	33.57	560	..	4	20	40	154	437	95	57	2	437
Al_2O_3	3.24	31	..	1	10	20	..	..	..	..	..	..
Cr_2O_3	.80	5	5	..	..	..	..	..	..	..	..	..
FeO	26.22	364	5	..	..	..	..	..	..	..	..	..
NiO	1.01	13	..	..	..	..	77	875	..	..	1	874
MnO	.68	10	..	..	..	..	..	..	..	..	..	..
MgO	19.74	493	..	..	..	..	..	..	..	..	..	..
CaO	5.45	97	..	..	..	20	77	..	..	76	1	..
Na_2O	.62	10	..	..	10	..	..	..	..	..	..	..
K_2O	.14	1	..	1	..	..	..	..	..	..	..	..
H_2O	.16	..	..	..	..	..	..	..	..	..	..	..
Fe	2.59	..	..	..	..	..	..	..	..	..	..	..
Ni	.36	..	..	..	..	..	..	..	..	..	..	..
Co	.08	..	..	..	..	..	..	..	..	..	..	..
Cu	.01	..	..	..	..	..	..	..	..	..	..	..
FeS	4.76	..	..	..	..	..	..	..	..	..	..	..
Graphite	.36	..	..	..	..	..	..	..	..	..	..	..
Sum	99.79	..	..	..	..	..	..	..	..	..	..	..

$$2x + 3y + \frac{z}{2} = 496 = \text{available } SiO_2$$

$$x + 4y \qquad = 77 = \text{molecules of } CaO$$

$$x + \qquad z = 875 = \text{molecules of } MgO + FeO.$$

Whence, $x = 1$ = diopside, $y = 19$ = akermanite, $z = 874$ = olivine.

Formula	Mol. Wt.			Norm			
$K_2O.Al_2O_3.4SiO_2$	1×436	= leucite	= .44	L	3.28	Sal	8.84
$Na_2O.Al_2O_3.2SiO_2$	10×284	= nephelite	= 2.84				
$CaO.Al_2O_3.2SiO_2$	20×278	= anorthite	= 5.56	F	5.56		
$CaO.SiO_2$	1×116						
$MgO.SiO_2$	5×100	= diopside	= .24	P	.24	Fem	90.24
$FeO.SiO_2$	5×132						
$2MgO.SiO_2$	492×70	= olivine	= 73.40	O	81.08		
$2FeO.SiO_2$	382×102						
$4CaO.3SiO_2$	19×404	= akermanite	= 7.68				
$FeO.Cr_2O_3$	5×224	= chromite	= 1.12	M	1.12		
FeS		= troilite	= 4.76	A	7.80		
$Fe_n N_m$		nickel-iron	= 3.04				
		H_2O	= .16				
		graphite	= .36				
			99.60				

Perfemic: $\frac{\text{Sal}}{\text{Fem}} = \frac{8.84}{90.24} < \frac{1}{7}$, Persilicic: $\frac{\text{POM}}{\text{A}} = \frac{82.44}{7.80} > \frac{7}{1}$, Perpolic: $\frac{\text{PO}}{\text{M}} = \frac{81.32}{1.12} > \frac{7}{1}$

Perolic: $\frac{\text{P}}{\text{O}} = \frac{.24}{81.08} < \frac{1}{7}$, Permirlic: $\frac{CaO + MgO + FeO}{Na_2O} = \frac{977}{10} > \frac{7}{1}$, Permiric: $\frac{MgO + FeO}{CaO} = \frac{880}{97} > \frac{7}{1}$

Magnesiferrous

$$\frac{MgO}{FeO} = \frac{493}{387} < \frac{5}{3} > \frac{3}{5}$$

ALPHABETICAL LIST OF THE STONE METEORITES ANALYSES OF WHICH ARE GIVEN

The numbers refer to the number of the analysis in the following table of analyses

Adare	74
Albareto	27
Alfianello	92, 111
Allegan	103
Angra dos Reis	11
Aussun	94, 109
Bachmut	69
Beaver Creek	95
Bishopville	32
Bjurböle	18
Blansko	112
Bluff	55
Borkut	29
Bremervörde	63
Buschhof	114
Busti	36, 37
Cabezzo de Mayo	118
Cape Girardeau	116
Carcote	17
Castalia	71
Chandakapur	21
Chateau Renard	56
Cold Bokkeveld	121
Constantinople	7
Coon Butte	39
Cynthiana	53
Dhurmsala	85
Drake Creek	70
Dundrum	72
Eli Elwah	62
Ensisheim	79
Ergheo	44
Estacado	26
Farmington	107
Felix	60
Forest City	115
Frankfort	2
Gnadenfrei	77
Gopalpur	73
Hendersonville	42
Heredia	117
Hessle	97, 113
Homestead	104, 105
Hvittis	64
Ibbenbühren	33
Jerome	61
Juvinas	1
Kaba	57
Kakova	58
Kernouvé	31
Khetree	102
Klein-Wenden	81
Knyahinya	10
Krähenberg	14, 68
Lesves	15
Linum	13
Lixna	99
Llano del Inca	30
Long Island	49
Lumpkin	106
Lundsgard	25
Manbhoom	48
Manegaum	34
Marion	93
Marjalahti	125
Mässing	3
Mauerkirchen	45, 110
Meuselbach	24
Mezö-Madaras	22
Middlesborough	41
Mincy	124
Mocs	65
Modoc	67
Mount Vernon	122
Nerft	19
New Concord	46, 50
Ngawi	40
Nowo-Urei	52
Ogi	98
Orgueil	78
Ornans	120
Orvinio	80

In some cases different analyses of the same meteorite require it to be placed in more than one group. Such cases indicate that further analyses are needed. In Busti for example there seems to be no way of determining whether Dancer's or Maskelyne's analysis is the more nearly correct and both must be used, but further analyses would probably furnish ground for eliminating one or the other. It is quite possible that a similar confusion would appear in terrestrial rocks if analyses of the same rock made at widely different times and by different analysts were compared. While some such discrepancies occur, in most cases plural analyses agree in placing the meteorite in the same group. This is true for example, of Homestead, New Concord, Aussun, Hessle, and others. In such cases the plurality of analyses happily confirms the placing of the meteorite. An opportunity for comparison of the grouping of meteorites in the quantitative classification with that of Rose, Tschermak, and Brezina is afforded by the Brezina symbol of each meteorite given in the tables. Comparison shows that on the whole the important groups of the German classification remain intact in the quantitative classification. Thus the howardities, eukrites, and chladnites occupy on the whole similar and separate places in both classifications. Among the subgroups of the chondrites little similarity of grouping in the two classifications can be noted, though the gray chondrites and spherical chondrites are rather more numerous among the less siliceous groups of the quantitative classification. This would be expected since the color and structure of the meteorites of these groups indicate a larger proportion of olivine than in the white or intermediate chondrites. Such a scattering of these groups, however, on

the whole emphasizes the impossibility of accurately classifying meteorites by their physical characters as has hitherto been attempted by the German system.

An interesting feature of the calculations is the indication which they afford of the presence of leucite or nephelite or both in some meteorites, such as Felix, Shytal, and Cold Bokkeveld. The calculation of these minerals was required by the low percentage of silica and suggests that a careful examination of the meteorites for these minerals, which have not been hitherto observed in meteorites, should be made. The most common meteorite type is seen from the tables to be that of Pultusk, perfemic, dosilicic, perpolic, pyrolic, permirlic, permiric, and domagnesic.

The Farmington type is also largely represented, differing from Pultusk only in being domolic instead of pyrolic. Further it will be seen by examining the tables that the great majority of meteorites are domagnesic and in making the calculations it was found that a proportion of Mg O to Fe O of very nearly 4:1 was highly preponderant and characteristic.

A summation of all the analyses, 125 in number, should give a fair average of the composition of stone meteorites. It gives the following result:

AVERAGE COMPOSITION OF STONE METEORITES

SiO_2	39.12
Al_2O_3	2.62
Fe_2O_3	.38
Cr_2O_3	.41
FeO	16.13
MnO	.18
NiO	.21
MgO	22.42
CaO	2.31
Na_2O	.81
K_2O	.20
H_2O	.20
Fe	11.46
Ni	1.15
Co	.05
S	1.98
P	.04
P_2O_5	.03
C	.06
Ni, Mn, Cu, Sn	.02
TiO_2	.02
SnO_2	.02
	99.82

The results agree very nearly with those obtained by Merrill* by the addition of 99 analyses, the principal difference being a larger percentage of Ca O in the present writer's result. The present writer's method of determining the minor constituents differed from that of Merrill in that the present writer divided the totals of these constituents by the total number of analyses instead of by the number of analyses in which each constituent was reported. It is evident that the writer's method will produce too low a result, but the other method may give one too high, since the minor constituents may have been lacking in analyses in which they were not reported. It may further be suggested by way of discussion of the interesting comparison made by Merrill between stony meteorites and the earth's crust, that only the lighter and more siliceous meteorites should be used for such a comparison. Stony meteorites having large percentages of free metal have too high a specific gravity to be strictly comparable with the earth's crust. Again it should be recognized that the greater abundance of certain elements at the surface of the earth may be on account of their greater solubility. Thus limestones have grown successively more calcic and less magnesian since early times and an increase in the amount of soda and potash at the surface might take place in the same way. It does not appear that such a process would explain the discrepancy in the amount of alumina but it might act to increase the amount of silica. That the earth's crust of earlier times was more nearly meteoritic in composition than the present seems to be indicated by the great deposits of iron oxide of earlier ages and the fact that the early limestones are more magnesian than the modern.

Adding the analyses of iron meteorites p. 229 to those previously published, and omitting about 60 obviously imperfect ones, 318 analyses are obtained from which the average composition of iron meteorites can be calculated by summation. This sum is as follows:

AVERAGE COMPOSITION OF IRON METEORITES

Fe	90.85
Ni	8.52
Co	.59
P	.17
S	.04
C	.03
Cu	.02
Cr	.01
	100.23

* Am. Jour. Sci. 1909, 4. 27, 471.

Combining this sum with that previously obtained from 125 analyses of stone meteorites, stone meteorites being here regarded as all those which have an appreciable quantity of silicates, the sum total gives according to Clarke's method* the average composition of meteorites as a whole. The method is, of course, empirical, but seems to be the only one available in our present state of knowledge. This sum is the following:

AVERAGE COMPOSITION OF METEORITES

Fe	68.43
SiO_2	11.07
Ni	6.44
MgO	6.33
FeO	4.55
Al_2O_3	.74
CaO	.65
S	.49
Co	.44
Na_2O	.23
P	.14
Cr_2O_3	.12
Fe_2O_3	.11
NiO	.06
K_2O	.05
MnO	.04
C	.04
Cu	.01
Cr	.01
P_2O_5	.01
TiO_2	.01
SnO_2	.01
	99.98

The present writer has previously suggested,† that the average composition of meteorites may represent the composition of the earth as a whole. If so the proportions of the elements in the earth as a whole would be as follows:

PROPORTION OF ELEMENTS IN THE EARTH AS A WHOLE AS DEDUCED FROM METEORITES

Iron	72.06
Oxygen	10.10
Nickel	6.50
Silicon	5.20

* Bull. U. S. Geol. Survey, 1891, 78, 33.
† Jour. Geol. 1901, 9, 630.

Magnesium	3.80
Sulphur	.49
Calcium	.46
Cobalt	.44
Aluminum	.39
Sodium	.17
Phosphorus	.14
Chromium	.09
Potassium	.04
Carbon	.04
Manganese	.03
Other elements	.05
	100.00

The large proportion of iron in the constitution of the earth indicated by meteorites is in accord with the earth's density, rigidity, and magnetic proportions. Assuming the density of the rocks of the earth's crust to be 2.8, which may be too high, and combining with it metal of the density of 7.8, which is an average of the density of iron meteorites, it will be found that 77.58 per cent of metal will be required to obtain a density of 5.57, that of the earth as a whole. This is very nearly that of the sum of the metals in the above result after eliminating the proportions present as oxides. Such a proportion of iron would seem to be in accord, as has been stated, with the earth's rigidity and magnetic properties.

SYNOPSIS OF METEORITE CLASSIFICATION

CLASS III. $\frac{Sal}{Fem} < \frac{5}{3} > \frac{3}{5}$

SALFEMIC

SUBCLASS I. $\frac{QFL}{CZ} > \frac{7}{1}$

PERQUARFELIC

Order.	1. $\frac{Q}{F} > \frac{7}{1}$ Perquaric	2. $\frac{Q}{F} < \frac{7}{1} > \frac{5}{3}$ Doquaric	3. $\frac{Q}{F} < \frac{5}{3} > \frac{3}{5}$ Quarfelic	4. $\frac{Q}{F} < \frac{3}{5} > \frac{1}{7}$ Quardofelic	5. $\frac{QL}{F} < \frac{1}{7}$ Perfelic
Rang 1. Peralkalic, $\frac{K_2O+Na_2O}{CaO} > \frac{7}{1}$					
Rang 2. Domalkalic, $\frac{K_2O+Na_2O}{CaO} < \frac{7}{1} > \frac{5}{3}$					
Rang 3. Alkalicalcic, $\frac{K_2O+Na_2O}{CaO} < \frac{5}{3} > \frac{3}{5}$					
Rang 4. Docalcic, $\frac{K_2O+Na_2O}{CaO} < \frac{3}{5} > \frac{1}{7}$					
Rang 5. Percalcic, $\frac{K_2O+Na_2O}{CaO} < \frac{1}{7}$					Juvinose

CLASS IV. $\frac{\text{Sal}}{\text{Fem}}<\frac{3}{5}>\frac{1}{7}$

DOFEMIC

SUBCLASS I. $\frac{\text{POM}}{\text{A}}>\frac{7}{1}$ PERSILICIC — ORDER 1. $\frac{\text{P.O}}{\text{M}}>\frac{7}{1}$ PERPOLIC

Section	1. $\frac{P}{O}>\frac{7}{1}$ Perpyric	2. $\frac{P}{O}<\frac{7}{1}>\frac{5}{3}$ Dopyric	3. $\frac{P}{O}<\frac{5}{3}>\frac{3}{5}$ Pyrolic	4. $\frac{P}{O}<\frac{3}{5}>\frac{1}{7}$ Domolic	5. $\frac{P}{O}<\frac{1}{7}$ Perolic
Rang I. Permirlic, $\frac{CaO+MgO+FeO}{Na_2O}>\frac{7}{1}$					
Section 1. Permiric, $\frac{MgO+FeO}{CaO}>\frac{7}{1}$					
Subrang 1. Permagnesic, $\frac{MgO}{FeO}>\frac{7}{1}$					
Subrang 2. Domagnesic, $\frac{MgO}{FeO}<\frac{7}{1}>\frac{5}{3}$			Udenose		Stawropolose
Subrang 3. Magnesiferrous, $\frac{MgO}{FeO}<\frac{5}{3}>\frac{3}{5}$					
Subrang 4. Doferrous, $\frac{MgO}{FeO}<\frac{3}{5}>\frac{1}{7}$					
Subrang 5. Perferrous, $\frac{MgO}{FeO}<\frac{1}{7}$					
Section 2. Domiric, $\frac{MgO+FeO}{CaO}<\frac{7}{1}>\frac{5}{3}$					
Subrang 1. Permagnesic, $\frac{MgO}{FeO}>\frac{7}{1}$					
Subrang 2. Domagnesic, $\frac{MgO}{FeO}<\frac{7}{1}>\frac{5}{3}$	Frankfortose				
Subrang 3. Magnesiferrous, $\frac{MgO}{FeO}<\frac{5}{3}>\frac{3}{5}$	Stannernose	Shergottose			
Section 3. Calcimiric, $\frac{MgO+FeO}{CaO}<\frac{5}{3}>\frac{3}{5}$					
Subrang 1. Permagnesic, $\frac{MgO}{FeO}>\frac{7}{1}$					
Subrang 2. Domagnesic, $\frac{MgO}{FeO}<\frac{7}{1}>\frac{5}{3}$			Angrose		
Subrang 3. Magnesiferrous, $\frac{MgO}{FeO}<\frac{5}{3}>\frac{3}{5}$					
Subrang 4. Doferrous, $\frac{MgO}{FeO}<\frac{3}{5}>\frac{7}{1}$	Constantino-plose				

SUBCLASS II. $\frac{\text{POM}}{\text{A}}<\frac{7}{1}>\frac{5}{3}$ DOSILICIC

Section	ORDER 1. $\frac{\text{P.O}}{\text{M}}>\frac{7}{1}$ PERPOLIC — 1. $\frac{P}{O}>\frac{7}{1}$ Perpyric	2. $\frac{P}{O}<\frac{7}{1}>\frac{5}{3}$ Dopyric	3. $\frac{P}{O}<\frac{5}{3}>\frac{3}{5}$ Pyrolic	4. $\frac{P}{O}<\frac{3}{5}>\frac{1}{7}$ Domolic	5. $\frac{P}{O}<\frac{1}{7}$ Perolic	ORDER 2. $\frac{\text{P.O}}{\text{M}}<\frac{7}{1}>\frac{5}{3}$ DOPOLIC — 1. $\frac{P}{O}>\frac{7}{1}$ Perpyric	2. $\frac{P}{O}<\frac{7}{1}>\frac{5}{3}$ Dopyric	3, 4 and 5 not represented
Rang I. Permirlic, $\frac{CaO+MgO+FeO}{Na_2O}>\frac{7}{1}$								
Section 1. Permiric, $\frac{MgO+FeO}{CaO}>\frac{7}{1}$								
Subrang 1. Permagnesic, $\frac{MgO}{FeO}>\frac{7}{1}$		Linumose					Pickensose	
Subrang 2. Domagnesic, $\frac{MgO}{FeO}<\frac{7}{1}>\frac{5}{3}$		Krahenbergose	Parnallose	Estacadose	Albaretose			
Subrang 3. Magnesiferrous, $\frac{MgO}{FeO}<\frac{5}{3}>\frac{3}{5}$								
Subrang 4. Doferrous, $\frac{MgO}{FeO}<\frac{3}{5}>\frac{1}{7}$								
Subrang 5. Perferrous, $\frac{MgO}{FeO}<\frac{1}{7}$								
Section 2. Domiric, $\frac{MgO+FeO}{CaO}<\frac{7}{1}>\frac{5}{3}$								
Subrang 1. Permagnesic, $\frac{MgO}{FeO}>\frac{7}{1}$								
Subrang 2. Domagnesic, $\frac{MgO}{FeO}<\frac{7}{1}>\frac{5}{3}$								
Subrang 3. Magnesiferrous, $\frac{MgO}{FeO}<\frac{5}{3}>\frac{3}{5}$								
Section 3. Calcimiric, $\frac{MgO+FeO}{CaO}<\frac{5}{3}>\frac{3}{5}$								
Subrang 1. Permagnesic, $\frac{MgO}{FeO}>\frac{7}{1}$								
Subrang 2. Domagnesic, $\frac{MgO}{FeO}<\frac{7}{1}>\frac{5}{3}$								
Subrang 3. Magnesiferrous, $\frac{MgO}{FeO}<\frac{5}{3}>\frac{3}{5}$								
Subrang 4. Doferrous, $\frac{MgO}{FeO}<\frac{3}{5}>\frac{7}{1}$								

SUBCLASS III. $\frac{\text{POM}}{\text{A}}<\frac{7}{1}>\frac{5}{3}$ SILICOMETALLIC — ORDER 1. $\frac{\text{P.O}}{\text{M}}>\frac{7}{1}$ PERPOLIC

Section	1. $\frac{P}{O}>\frac{7}{1}$ Perpyric	2. $\frac{P}{O}<\frac{7}{1}>\frac{5}{3}$ Dopyric	3. $\frac{P}{O}<\frac{5}{3}>\frac{3}{5}$ Pyrolic	4. $\frac{P}{O}<\frac{3}{5}>\frac{1}{7}$ Domolic	5. $\frac{P}{O}<\frac{1}{7}$ Perolic
Rang I. Permirlic, $\frac{CaO+MgO+FeO}{Na_2O}>\frac{7}{1}$					
Section 1. Permiric, $\frac{MgO+FeO}{CaO}>\frac{7}{1}$					
Subrang 1. Permagnesic, $\frac{MgO}{FeO}>\frac{7}{1}$			Borkutose		
Subrang 2. Domagnesic, $\frac{MgO}{FeO}<\frac{7}{1}>\frac{5}{3}$				Kernouvose	
Subrang 3. Magnesiferrous, $\frac{MgO}{FeO}<\frac{5}{3}>\frac{3}{5}$			Incose		
Subrang 4. Doferrous, $\frac{MgO}{FeO}<\frac{3}{5}>\frac{1}{7}$					
Subrang 5. Perferrous, $\frac{MgO}{FeO}<\frac{1}{7}$					
Section 2. Domiric, $\frac{MgO+FeO}{CaO}<\frac{7}{1}>\frac{5}{3}$					
Subrang 1. Permagnesic, $\frac{MgO}{FeO}>\frac{7}{1}$					
Subrang 2. Domagnesic, $\frac{MgO}{FeO}<\frac{7}{1}>\frac{5}{3}$					
Subrang 3. Magnesiferrous, $\frac{MgO}{FeO}<\frac{5}{3}>\frac{3}{5}$					
Section 3. Calcimiric, $\frac{MgO+FeO}{CaO}<\frac{5}{3}>\frac{3}{5}$					
Subrang 1. Permagnesic, $\frac{MgO}{FeO}>\frac{7}{1}$					
Subrang 2. Domagnesic, $\frac{MgO}{FeO}<\frac{7}{1}>\frac{5}{3}$					
Subrang 3. Magnesiferrous, $\frac{MgO}{FeO}<\frac{5}{3}>\frac{3}{5}$					
Subrang 4. Doferrous, $\frac{MgO}{FeO}<\frac{3}{5}>\frac{7}{1}$					

CLASS V. $\frac{Sal}{Fem} < \frac{1}{7}$

PERFEMIC

	SUBCLASS I. $\frac{POM}{A} > \frac{7}{1}$ PERSILICIC								SUBCLASS II. $\frac{POM}{A} < \frac{7}{1} > \frac{5}{3}$ DOSILICIC					SUBCLASS III. $\frac{POM}{A} < \frac{5}{3} > \frac{3}{5}$ SILICOMETALLIC	SUBCLASS IV. $\frac{POM}{A} < \frac{3}{5} > \frac{1}{7}$ DOMETALLIC			
	ORDER 1. $\frac{PO}{M} > \frac{7}{1}$ PERPOLIC					ORDER 2. $\frac{PO}{M} < \frac{7}{1} > \frac{5}{3}$ DOPOLIC			ORDER 1. $\frac{PO}{M} > \frac{7}{1}$ PERPOLIC					Not represented	ORDER 1. $\frac{PO}{M} > \frac{7}{1}$ PERPOLIC			
Section..................	1. $\frac{P}{O} > \frac{7}{1}$ Perpyric	2. $\frac{P}{O} < \frac{7}{1} > \frac{5}{3}$ Dopyric	3. $\frac{P}{O} < \frac{5}{3} > \frac{3}{5}$ Pyrolic	4. $\frac{P}{O} < \frac{3}{5} > \frac{1}{7}$ Domolic	5. $\frac{P}{O} < \frac{1}{7}$ Perolic	1. $\frac{P}{O} > \frac{7}{1}$ Perpyric	2. $\frac{P}{O} < \frac{7}{1} > \frac{5}{3}$ Dopyric	3. $\frac{P}{O} < \frac{5}{3} > \frac{3}{5}$ Pyrolic	1. $\frac{P}{O} > \frac{7}{1}$ Perpyric	2. $\frac{P}{O} < \frac{7}{1} > \frac{5}{3}$ Dopyric	3. $\frac{P}{O} < \frac{5}{3} > \frac{3}{5}$ Pyrolic	4. $\frac{P}{O} < \frac{3}{5} > \frac{1}{7}$ Domolic	5. $\frac{P}{O} < \frac{1}{7}$ Perolic		1. $\frac{P}{O} > \frac{7}{1}$ Perpyric	2. $\frac{P}{O} < \frac{7}{1} > \frac{5}{3}$ Dopyric	3 and 4 not represented	5. $\frac{P}{O} < \frac{1}{7}$ Perolic
Rang 1. Permirlic, $\frac{CaO + MgO + FeO}{Na_2O} > \frac{7}{1}$																		
Section 1. Permiric, $\frac{MgO + FeO}{CaO} > \frac{7}{1}$																		
Subrang 1. Permagnesic, $\frac{MgO}{FeO} > \frac{7}{1}$	Bishopvillose	×							Hvittisose		Orviniose							Marjalahtose
Subrang 2. Domagnesic, $\frac{MgO}{FeO} < \frac{7}{1} > \frac{5}{3}$	Ibbenbührenose	Shalkose	Travisose	Wacondose	Kakovose			Elwahose	Mocsose	Castaliose	Pultuskose	Farmingtonose	Ornansose		Steinbachose	Minciose		
Subrang 3. Magnesiferrous, $\frac{MgO}{FeO} < \frac{5}{3} > \frac{3}{5}$		Middlesborose	Concordose	Kabose	Jeromose					Ensisheimose	Homesteadose							
Subrang 4. Doferrous, $\frac{MgO}{FeO} < \frac{3}{5} > \frac{1}{7}$																		
Subrang 5. Perferrous, $\frac{MgO}{FeO} < \frac{1}{7}$																		
Section 2. Domiric, $\frac{MgO + FeO}{CaO} < \frac{7}{1} > \frac{5}{3}$																		
Subrang 1. Permagnesic, $\frac{MgO}{FeO} > \frac{7}{1}$	Bustose																	
Subrang 2. Domagnesic, $\frac{MgO}{FeO} < \frac{7}{1} > \frac{5}{3}$																		
Subrang 3. Magnesiferrous, $\frac{MgO}{FeO} < \frac{5}{3} > \frac{3}{5}$																		

ANALYSES OF STONE METEORITES

COMPILED AND CLASSIFIED ACCORDING TO THE PRINCIPLES OF THE AMERICAN QUANTITATIVE CLASSIFICATION

CLASS III

SALFEMIC, PERQUARFELIC, PERFELIC, PERCALCIC, JUVINOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
1. Juvinas	49.23	12.55	20.33	6.44	10.23	0.63	0.12	0.16	....	....	0.09	....	Fe_2O_3 1.21 TiO_2 0.10 Cr_2O_3 0.24 P_2O_5 0.28	101.61	3.12	*Q* 2.2 *di* 14.4 *or* 0.6 *hy* 44.2 *ab* 5.2 *mt* 1.9 *an* 31.1	Eu	C. Rammelsberg	Ann. Phys. Chem. 1848, 77, 585–590

CLASS IV

DOFEMIC, PERSILICIC, PERPOLIC, PERPYRIC, PERMIRLIC, DOMIRIC, DOMAGNESIC, FRANKFORTOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
2. Frankfort	51.33	8.05	13.70	17.59	7.03	0.45	0.22	tr	tr	....	0.23	....	Cr_2O_3 0.42	99.02	3.31	*or* 1.1 *di* 12.4 *cm* 0.7 *ab* 3.7 *hy* 59.4 *tr* 0.6 *an* 19.5 *ol* 6.3	Ho	G. J. Brush and W. J. Mixter	Am. Jour. Sci. 1869, 2, 48, 243

DOFEMIC, PERSILICIC, PERPOLIC, PERPYRIC, PERMIRLIC, DOMIRIC, MAGNESIFERROUS, STANNERNOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
3. Mässing	53.12	8.20	19.14	8.48	5.79	1.93	1.19	0.52	....	....	0.37	....	Cr_2O_3 0.98	99.72	3.36	*Q* 1.3 *di* 15.9 *cm* 1.6 *or* 7.2 *hy* 45.8 *tr* 1.1 *ab* 16.2 *nf* 0.6 *an* 10.0	Ho	A. Schwager	Sitzber. München Akad. 1878, 8, 32–40
4. Petersburg	49.21	11.05	20.41	8.13	9.01	0.82	....	0.50	tr	....	0.06	....		99.23	3.20	*Q* 0.1 *di* 15.5 *tr* 0.2 *ab* 6.8 *hy* 49.5 *nf* 0.5 *an* 26.4	Ho	J. L. Smith	Am. Jour. Sci. 1861, 2, 31, 265
5. Peramiho	49.32	11.24	20.65	7.15	10.84	0.40	0.25	....	....	....	0.23	....	TiO_2 0.42	100.50		*Q* 1.2 *di* 21.7 *il* 0.8 *or* 1.7 *hy* 43.3 *tr* 0.6 *ab* 3.1 *an* 28.1	Eu	E. Ludwig	Sitzber. Wien Akad. 1903, 112, 739–777
6. Stannern	48.30	12.65	19.32	6.87	11.27	0.62	0.23	....	....	....	tr	....	Chromite 0.54 MnO 0.81	100.61	3.05	*or* 1.1 *d* 20.9 *cm* 0.5 *ab* 5.2 *hy* 35.9 *an* 31.1 *ol* 5.6	Eu	C. Rammelsberg	Ann. Phys. Chem. 1851, 83, 591–593

DOFEMIC, PERSILICIC, PERPOLIC, PERPYRIC, PERMIRLIC, CALCIMIRIC, DOFERROUS, CONSTANTINOPLOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
7. Constantinople	48.59	12.63	20.99	6.16	10.39	0.46	0.16	....	....	....	....	....	Cr_2O_3 0.44 MnO tr	99.82		*Q* 0.5 *di* 16.8 *or* 1.1 *hy* 45.3 *ab* 3.7 *cm* 0.4 *an* 32.0	Eu	G. Tschermak	Min. Mitth. 1872, 2, 85

DOFEMIC, PERSILICIC, PERPOLIC, DOPYRIC, PERMIRLIC, DOMIRIC, MAGNESIFERROUS, SHERGOTTOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
8. Shergotty	50.21	5.90	21.85	10.00	10.41	1.28	0.57	....	....	....	....	....		100.22		*or* 3.3 *di* 36.2 *ab* 11.0 *hy* 24.5 *an* 8.6 *ol* 16.7	She	E. Lumpe	Min. Mitth. 1871, 55–56

ANALYSES OF STONE METEORITES—*Continued*

DOFEMIC, PERSILICIC, PERPOLIC, PYROLIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, UDENOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
9. Uden	44.58	4.10	22.41	20.67	2.28	0.94	0.49	1.77			Fe S 0.72		Chromite 0.76 Mu O 0.43 Ni O 0.29	99.44	3.40	*or* 2.8 *di* 4.8 *cm* 0.8 *ab* 7.9 *hy* 29.7 *tr* 0.7 *an* 5.6 *ol* 45.4 *nf* 1.8	Cwb	Baumhauer and Seelheim	Ann. Phys. Chem. 1862, 116, 185–188
10. Knyahinya	44.30	3.06	16.38	22.16	2.73	1.00	0.66	5.00			Fe S 2.22		Chromite 0.80	98.31	3.52	*or* 3.9 *di* 9.5 *cm* 0.8 *ab* 8.4 *hy* 28.9 *tr* 2.2 *an* 2.0 *ol* 37.6 *nf* 5.0	Cg	E. H. von Baumhauer	Arch. Neerland, 1872, 7, 146–153, Mass anal. calc. by Wadsworth

DOFEMIC, PERSILICIC, PERPOLIC, PYROLIC, PERMIRLIC, CALCIMIRIC, DOMAGNESIC, ANGROSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
11. Angra dos Reis	43.94	8.73	8.28	10.05	24.51	0.26	0.19	0.81	....	....	0.45	....	Fe_2O_3 0.31 TiO_2 2.39 P_2O_5 0.13	100.05	...	*lc* 0.9 *di* 35.1 *mt* 0.5 *ne* 1.1 *ol* 15.7 *ap* 0.3 *an* 22.0 *am* 20.2 *tr* 1.3 *nf* 0.8	Angrite	Ludwig and Tschermak	Min. u. petr. Mitth. N. F. 1909, 28, 113

DOFEMIC, PERSILICIC, PERPOLIC, PEROLIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, STAWROPOLOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
12. Stawropol	33.16	4.22	18.59	29.24	1.20	1.40	0.60	4.32	....	....	1.60	....	Ni O 3.81 SnO_2 1.10	99.24	3.59	*lc* 2.6 *ol* 71.0 *tr* 4.4 *ne* 6.5 *am* 0.8 *nf* 4.3 *an* 3.3 *mo* 4.3	Ck	H. Abich	Bull. Akad. St. Petersburg, 1860, 1862, 403–422, 433–439

DOFEMIC, DOSILICIC, PERPOLIC, DOPYRIC, PERMIRLIC, PERMIRIC, PERMAGNESIC, LINUMOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
13. Linum	43.05	2.44	1.32	25.72	3.49	1.39	0.26	15.83	0.71	....	1.85	0.07	Cr_2O_3 0.31 Mn O 0.20 H_2O 0.12 Fe S 3.23	99.99	3.54	*or* 1.6 *ns* 0.2 *cm* 0.5 *ab* 11.0 *di* 5.0 *tr* 1.5 *hy* 43.0 *oh* 2.9 *ol* 13.3 *nf* 16.5	Cw	Lindner	Sitzber, Berlin Akad. 1904, 114–153

DOFEMIC, DOSILICIC, PERPOLIC, DOPYRIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, KRÄHENBERGOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
14. Krähenberg	41.12	3.22	17.42	18.62	2.06	0.17	1.22	10.37	1.36	....	2.35	0.46	Cr_2O_3 0.89 Mn O 0.78 SnO_2 0.18	100.22	...	*or* 7.2 *di* 4.9 *cm* 1.3 *ab* 1.6 *hy* 44.8 *tr* 6.4 *an* 4.2 *ol* 16.2 *nf* 11.7	Cho	Keller	Sitzber, München Akad. 1878, 8, 47–58

DOFEMIC, DOSILICIC, PERPOLIC, PYROLIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, PARNALLOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
15. Lesves	39.46	3.33	15.82	22.75	1.54	1.05	0.09	12.36	1.37	0.11	2.25	....	Cr_2O_3 1.02	101.15	3.58	*or* 0.6 *di* 3.1 *cm* 1.6 *ab* 8.9 *hy* 30.9 *tr* 6.2 *an* 3.9 *ol* 31.0 *nf* 13.8	Cw	A. F. Renard	Bull. de l'Acad. roy. de Belgique, 1896, 3, 31, 654–663
16. Parnallee	39.41	2.57	15.28	22.82	0.56	1.91	0.55	9.83	0.90	0.06	2.71	0.10	Mn O 0.54 H_2O 0.68 Ni O 0.72 Co O 0.06	98.70	3.12	*or* 2.8 *ns* 1.3 *tr* 7.4 *ab* 10.5 *di* 2.2 *nf* 10.8 *hy* 25.8 *ol* 34.5	Cga	E. Pfeiffer	Sitzber, Wien. Akad. 1863, 47, 2, 460–463
17. Carcote	39.28	2.39	14.29	22.79	1.19	1.40	0.30	8.95	0.91		Fe S 5.98	0.21	Chromite 1.43 Cu+Sn 0.06 Mn 0.14 C 0.19 Res 0.49	100.00	3.47	*or* 1.7 *ns* 0.2 *cm* 1.4 *ab* 11.0 *di* 4.7 *tr* 6.0 *hy* 22.3 *nf* 10.1 *ol* 40.4	Ck	Will	Neues Jahrb. 1889, 2, 177–179, Mass anal. calc. by Farrington

ANALYSES OF STONE METEORITES—*Continued*

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
DOFEMIC, DOSILICIC, PERPOLIC, DOMOLIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, ESTACADOSE																			
18. Bjurböle	41.06	2.55	13.80	25.75	1.82	1.24	0.32	6.38	0.72	0.04	Fe S 5.44	0.14	Cr_2O_3 0.59 Mn O 0.12 Ni O 0.07	100.04	...	*or* 1.7 *di* 6.3 *cm* 0.9 *ab* 10.5 *hy* 18.4 *tr* 5.4 *an* 0.6 *ol* 47.8 *nf* 7.1	Cca	Ramsay and Borgström	Bull. Com. Geol. de Finland, 1902, 12, 13
19. Nerft	40.00	3.52	15.98	25.59	0.05	1.65	0.08	8.36	1.32	tr	2.02	0.05	Chromite 0.65 Mn O 0.03 Mn 0.10	99.40	...	*or* 0.6 *hy* 21.1 *cm* 0.7 *ab* 14.1 *ol* 45.2 *tr* 5.5 *an* 0.3 *nf* 9.8 *C* 0.5	Cia	A. Kuhlberg	Ann. Phys. Chem. 1869 136, 448–449
20. Rakowka	38.87	2.66	13.44	24.60	2.36	2.04	0.37	5.67	1.43	0.32	Fe S 6.16	0.12	C 0.13 Mn tr	99.22	3.58	*or* 2.2 *ns* 1.3 *cm* 0.8 *ab* 11.5 *di* 9.4 *sc* 0.8 *hy* 5.2 *tr* 6.2 *ol* 54.0 *nf* 7.4	Ci	P. Grigorieux	Zeitschr. deutsch. Geol. Gesell. 1880, 32, 417–420
21. Chandakapur	38.02	4.17	19.81	21.31	2.42	1.26	0.29	5.25	0.55		Fe S 4.92	Fe_3P 1.06	Chromite 0.51 Ni O 0.07	99.94	...	*or* 1.7 *di* 5.7 *mt* 0.3 *ab* 10.5 *hy* 4.0 *cm* 0.5 *an* 5.0 *ol* 60.5 *sc* 1.1 *tr* 4.9 *nf* 5.8	Cib	H. E. Clarke	Min. Mag. 1910, 15, 371
22. Mezö-Madaras	37.64	3.41	15.44	24.11	1.68	1.76	tr	12.12	1.64	....	2.27	....	Chromite 0.54 Mn O 0.18 Ni O 0.06	100.85	...	*ab* 14.8 *di* 5.6 *cm* 0.7 *an* 1.4 *hy* 8.1 *tr* 6.3 *ol* 49.1 *nf* 13.8	Cgb	C. Rammelsberg.	Zeitschr. deutsch. Geol. Gesell. 1871, 23, 734–737, Mass anal. calc. by Wadsworth
23. Tourinnes-la-Grosse	37.47	3.65	13.89	24.40	2.61	2.26		11.05	1.30	....	2.21	....	Chromite 0.71 Sn 0.17	99.72	3.53	*ab* 15.2 *ns* 0.1 *cm* 0.7 *ne* 2.0 *di* 10.2 *tr* 6.1 *ol* 51.9 *nf* 12.5	Cw	F. Pisani	Comptes Rendus, 1864, 58, 169–171
24. Meuselbach	37.30	2.89	16.20	24.55	1.72	1.32	....	6.71	1.07	0.11	Fe S 7.79	....	Chromite 0.34 Cn tr	100.00	...	*ab* 11.0 *di* 5.2 *cm* 0.3 *an* 2.0 *hy* 6.1 *tr* 7.8 *ol* 59.7 *nf* 7.9	Ccka	G. Linck	Ann. Wien. Mus. 1899, 13, 103–114, Mass anal. calc. by Farrington
25. Lundsgård	36.97	2.70	13.18	23.79	1.40	1.42	0.43	14.46	1.91	0.02	2.38	0.10	Chromite 0.59 Ni O 0.05 H_2O 0.50 Cu 0.04 C 0.02	99.96	3.61	*or* 2.2 *ns* 0.1 *cm* 0.9 *ab* 11.5 *di* 5.5 *tr* 6.5 *hy* 15.8 *sc* 0.6 *ol* 38.4 *nf* 16.4	Cw	O. Nordenskjöld.	Geol. Foren. i. Stockholm, Förh. 1891, 13, 470–475
26. Estacado	35.82	3.60	15.53	22.74	2.99	2.07	0.32	14.68	1.60	0.08	1.37	0.15	Cr_2O_3 tr Mn O tr TiO_2 tr Cu tr	100.95	3.60	*or* 1.7 *ns* 0.1 *tr* 3.8 *ab* 9.4 *di* 12.0 *sc* 1.0 *ne* 4.0 *ol* 51.5 *nf* 16.4	Ckb	J. M. Davison	Am. Jour. Sci. 1906, 3, 22, 59
DOFEMIC, DOSILICIC, PERPOLIC, PEROLIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, ALBARETOSE																			
27. Albareto	35.91	4.48	24.31	22.77	2.07	1.64	0.44	4.33	0.73	0.11	2.37	....		99.16	...	*or* 2.2 *di* 5.2 *tr* 6.5 *ab* 5.8 *ol* 64.8 *nf* 5.2 *ne* 4.3 *an* 4.9	Cc	P. Maissen	Gazetta Chimica, 1880, 10, 20
DOFEMIC, DOSILICIC, DOPOLIC, DOPYRIC, PERMIRLIC, PERMIRIC, PERMAGNESIC, PICKENSOSE																			
28. Pickens County	37.06	5.83	9.63	24.00	0.55	0.92	0.02	8.22	1.23	0.11	1.57	....	Fe_2O_3 10.69 TiO_2 0.09 Mn O 0.40 P_2O_5 0.31 Cr O 0.36 Cu O 0.06	101.05	...	*ab* 7.9 *hy* 42.0 *mt* 15.5 *an* 0.8 *ol* 15.2 *il* 0.2 *C* 4.0 *ap* 0.7 *tr* 4.3 *nf* 9.6	....	E. Everhart	Science, 1909, N. S. 30, 772
DOFEMIC, SILICOMETALLIC, PERPOLIC, PYROLIC, PERMIRLIC, PERMIRIC, PERMAGNESIC, BORKUTOSE																			
29. Borkut	35.28	2.74	4.71	19.92	1.95	1.91	0.66	27.03	1.84		0.89	0.03	Chromite 0.64 Cu + Sn 0.08 Ni + Mn 0.78	98.46	...	*or* 3.9 *ns* 1.3 *cm* 0.6 *ab* 10.0 *di* 7.6 *tr* 2.5 *hy* 20.7 *nf* 29.7 *ol* 21.2	Cc	J. Nuricsany	Sitzb. Wien. Akad. 1856, 20, 398–406. Mass anal. calc. by Wadsworth

ANALYSES OF STONE METEORITES—*Continued*

Name	SiO_2	Al_2O_3	Fe O	Mg O	Ca O	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
DOFEMIC, SILICOMETALLIC, PERPOLIC, PYROLIC, PERMIRLIC, PERMIRIC, MAGNESIFERROUS, INCOSE																			
30. Llano del Inca.....	26.02	4.70	19.29	8.15	3.45	....	....	23.29	2.38	0.16	Fe S 10.61	....	Cr_2O_3 0.29 Mn O 0.06 Ni O 0.90 P_2O_5 0.79	100.00	...	*an* 12.8 *hy* 27.6 *ap* 1.7 *ol* 22.1 *tr* 10.6 *cm* 0.5 *nf* 25.8	M	L. G. Eakins....	Proc. Rochester Acad. Sci. 1890, 1, 94. Mass anal. calc. by Farrington
DOFEMIC, SILICOMETALLIC, PERPOLIC, DOMOLIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, KERNOUVOSE																			
31. Kernouvé.........	32.95	3.19	11.70	23.68	1.89	1.41		22.25	1.55	....	2.15	....		100.77	3.75	*ab* 12.1 *di* 5.8 *tr* 6.1 *an* 2.2 *hy* 2.5 *nf* 23.8 *ol* 47.5	Ck	F. Pisani........	Comptes Rendus, 1869, 68, 1489–1491
PERFEMIC, PERSILICIC, PERPOLIC, PERPYRIC, PERMIRLIC, PERMIRIC, PERMAGNESIC, BISHOPVILLOSE																			
32. Bishopville.......	59.97	....	....	39.34	....	0.74	tr	....	....	....	....	....	Fe_2O_3 0.40 Li_2O tr	100.45	...	*ac* 0.9 *mo* 0.1 *ns* 1.2 *hy* 98.1	Chla	J. L. Smith......	Am. Jour. Sci. 1864, 2, 38, 225
PERFEMIC, PERSILICIC, PERPOLIC, PERPYRIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, IBBENBÜHRENOSE																			
33. Ibbenbühren......	54.49	1.06	17.34	26.12	1.22	....	....	....	....	....	....	....	Mn O 0.28	100.51	3.41	*an* 3.1 *di* 2.3 *hy* 91.7 *ol* 3.5	Chl	G. von Rath....	Sitzber. nieder. Gesell. Bonn, 1871, 28, 142–145
34. Manegaum.......	53.63	....	20.48	23.32	1.40	....	....	....	....	....	....	....	Chromite 1.03	99.95	3.20	*di* 6.1 *cm* 1.0 *hy* 92.9	Chl	....	N. S. Maskelyne, Phil. Trans. 1870, 109, 211–213
35. Shalka...........	52.64	....	19.78	26.38	0.55	0.40	....	....	....	....	....	....	Cr_2O_3 0.23	99.98	3.41	*ns* 0.7 *cm* 2.2 *di* 2.3 *hy* 83.2 *ol* 11.4	Chl	C. Rammelsberg	Monatsber. Berlin Akad. 1870, 316–322
PERFEMIC, PERSILICIC, PERPOLIC, PERPYRIC, PERMIRLIC, DOMIRIC, PERMAGNESIC, BUSTOSE																			
36. Busti............	52.87	....	0.19	28.32	12.40	0.57	0.24	....	....	....	....	....	Ca S 4.13 Li_2O 0.02 Ca SO_4 0.44	99.18	...	*ks* 0.3 *oh* 4.1 *ns* 1.1 *di* 47.7 *hy* 36.6 *ol* 8.7	Bu	N. S. Maskelyne	Phil. Trans. 1870, 140, 193–211
PERFEMIC, PERSILICIC, PERPOLIC, DOPYRIC, PERMIRLIC, PERMIRIC, PERMAGNESIC																			
37. Busti............	52.73	....	4.28	37.22	1.18	....	tr	....	....	....	....	....	Ni O 0.78 Na_2S 0.76 Mn O 0.01 Apatite tr H_2O 0.92 Ca SO_4 1.58 Li_2O tr Ca Cl_2 0.01	99.47	...	*di* 4.6 *hy* 71.0 *ol* 20.7	Bu	W. Dancer......	Phil. Trans. 1870, 140, 193–211

ANALYSES OF STONE METEORITES—*Continued*

PERFEMIC, PERSILICIC, PERPOLIC, DOPYRIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, SHALKOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
38. Shalka	52.51	0.66	16.81	28.35	0.89	0.22	....	....	....	....	FeS 0.39	tr	Cr_2O_3 1.25	101.08	...	*ab* 1.6 *di* 2.7 *cm* 1.8 *an* 1.1 *hy* 78.4 *tr* 0.4 *ol* 15.1	Chl	H. B. von Foullon	Ann. Wien. Mus. 1888, 3, 195–208
39. Coon Butte	42.62	1.69	12.98	26.55	0.96	0.40	0.12	7.71	0.93	0.01	FeS 2.15	Fe_3P 0.76	Fe_2O_3 2.60 Chromite 0.08 Cu, Mn, Sn, tr	100.00	3.47	*or* 0.6 *di* 1.5 *mt* 3.7 *ab* 3.1 *hy* 47.5 *tr* 2.2 *an* 2.8 *ol* 29.3 *sc* 0.8 *nf* 7.7	Cib	J. W. Mallet	Am. Jour. Sci. 1906, 4. 21, 353. Mass anal. calc. by Farrington

PERFEMIC, PERSILICIC, PERPOLIC, DOPYRIC, PERMIRLIC, PERMIRIC, MAGNESIFERROUS, MIDDLESBOROSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
40. Ngawi	42.77	0.78	24.06	15.31	2.63	2.73	0.45	2.87	0.65	tr	FeS 5.71	....	Chromite 0.47 NiO 1.57 MnO tr	100.00	...	*or* 2.2 *ns* 4.9 *cm* 0.5 *ab* 2.1 *di* 10.6 *tr* 5.7 *hy* 43.2 *nf* 3.5 *ol* 27.2	Ccn	E. H. von Baumhauer	Arch. Neerland, 1884, 19, 175–185
41. Middlesborough	42.61	1.75	23.80	20.86	1.60	....	....	7.22	2.00	0.16	....	....		100.00	...	*an* 4.7 *di* 2.8 *nf* 9.4 *hy* 52.2 *ol* 31.0	Cw	W. Flight	Phil. Trans. Roy. Soc. 1882, 3, 885–899. Mass anal. calc. by Farrington

PERFEMIC, PERSILICIC, PERPOLIC, PYROLIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, TRAVISOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
42. Hendersonville	46.06	2.20	14.33	28.62	2.13	0.96	0.10	2.37	0.21	0.01	1.61	0.01	Cr_2O_3 0.23 Residue 0.51	99.35	...	*or* 0.6 *di* 7.3 *cm* 0.2 *ab* 8.4 *hy* 36.5 *tr* 4.4 *an* 1.4 *ol* 36.5 *nf* 2.6	Cc	Wirt Tassin	Proc. U. S. Nat. Mus. 1907, 32, 79–82
43. Travis County	44.75	2.72	16.04	27.93	2.23	1.13	0.13	1.83	0.22	0.01	1.83	....	Cr_2O_3 0.52 H_2O 0.84 MnO tr P_2O_5 0.41 CuO tr	101.11	3.54	*or* 0.6 *di* 5.1 *cm* 0.7 *ab* 9.4 *hy* 30.0 *tr* 5.0 *an* 2.0 *ol* 44.0 *ap* 0.9 *nf* 2.1	Cs	L. G. Eakins	Bull. U. S. Geol. Survey 1891, 78, 91
44. Ergheo	42.53	2.23	17.13	26.13	1.08	0.13		0.57	0.17	....	FeS 9.48	....		99.45	3.31	*ab* 1.1 *hy* 45.9 *tr* 9.5 *an* 5.6 *ol* 36.8 *nf* 0.7	Ckb	G. Boeris	Soc. d'Esploraz. Comm. in Africa, Milan 1898, 13
45. Mauerkirchen	41.53	1.71	23.32	24.20	2.12	0.24	0.15	3.75		....	0.70	....		98.44	...	*or* 0.6 *di* 5.9 *cm* 0.7 *ab* 2.1 *hy* 32.3 *tr* 1.9 *an* 3.3 *ol* 47.4 *nf* 3.8	Cw	F. Crook	Chem. Const. Met. Stones, 26–30
46. New Concord	40.39	2.30	18.13	23.51	2.52	....	....	5.78	0.24	....	....	....	Fe_2O_3 5.82 NiO 0.81 Mn tr	99.50	...	*an* 6.4 *di* 4.9 *mt* 8.4 *hy* 40.6 *nf* 6.0 *ol* 33.2	Cia	A. Madelung	Buchner's Meteoriten 1863, 105
47. Sokobanja	40.14	....	25.54	25.78	....	0.26	0.06	....	....	....	1.46	tr		100.21	...	*ks* 0.2 *tr* 4.1 *ns* 0.5 *nf* 6.8 *hy* 41.3 *ol* 46.6	Cc	S. M. Losanitch	Ber. Chem. Gesell. Berlin 1878, 11, 96–98. Mass anal. calc. by Wadsworth
48. Manbhoom	40.12	1.80	20.53	27.30	1.93	0.44	0.20	4.24	0.91	....	1.70	0.20	Fe_2O_3 0.83 Cr_2O_3 0.55 MnO 0.07	100.82	...	*or* 1.1 *di* 5.6 *mt* 1.2 *ab* 3.7 *hy* 24.8 *cm* 0.9 *an* 2.5 *ol* 48.9 *tr* 4.7 *sc* 1.2 *nf* 5.2	Bu	H. B. von Foullon	Ann. Wien. Mus. 1888, 3, 195–208
49. Long Island	35.65	3.08	22.85	22.74	1.40	0.25	0.03	2.60	0.67	0.04	1.90	0.06	Cr_2O_3 6.33 H_2O 1.52 NiO 0.77 CoO 0.06 MnO tr	99.95	3.45	*ab* 2.1 *hy* 27.3 *cm* 9.4 *an* 7.0 *ol* 42.3 *tr* 5.2 *C* 0.1 *sc* 0.4 *nf* 3.3	Cia	H. W. Nichols	Pubs. Field Col. Mus. Geol. Ser. 1902, 1, 297

PERFEMIC, PERSILICIC, PERPOLIC, PYROLIC, PERMIRLIC, PERMIRIC, MAGNESIFERROUS, CONCORDOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
50. New Concord	41.73	0.28	24.72	21.64	0.02	0.92		9.23	1.31	0.04	0.11	tr	Cu tr Mn tr	100.00	3.55	*ab* 1.6 *ns* 1.5 *tr* 0.3 *hy* 50.4 *nf* 10.6 *ol* 35.6	Cia	J. L. Smith	Am. Jour. Sci. 1861, 2, 31, 87–98. Mass anal. calc. by Farrington

ANALYSES OF STONE METEORITES—*Continued*

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
PERFEMIC, PERSILICIC, PERPOLIC, DOMOLIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, WACONDOSE																			
51. Zavid	41.90	1.92	27.40	22.79	4.60	1.05	0.41	0.15	....	....	1.01	....	H_2O 0.39	101.11	3.55	*or* 2.2 *ns* 0.2 *tr* 2.7 *ab* 7.9 *di* 18.7 *nf* 0.2 *ol* 68.7	Cia	C. Hödlmoser	Wiss. Mitth. Bosnia u. Herzegovinia, 1901, 8, 419
52. Nowo-Urei	39.51	0.60	13.35	35.80	1.40	....	....	5.25	0.20	....	0.15	0.02	Cr_2O_3 0.05 MnO 0.43 Carbon 1.26 Diamond 1.00	99.92	...	*an* 1.7 *di* 4.2 *cm* 1.3 *hy* 16.7 *tr* 0.4 *ol* 67.2 *nf* 5.5	U	M. Jerofejeff and P. Latschinoff	Verh. d. Russ. Kais. Miner. Ges. 1888, 24, 34 pp.
53. Cynthiana	38.99	0.22	19.73	26.56	2.20	0.49	....	5.36	0.50	0.07	FeS 5.50	....	Cr_2O_3 0.15	99.77	3.41	*ab* 1.1 *ns* 0.7 *cm* 0.2 *di* 8.8 *tr* 5.5 *hy* 23.0 *nf* 5.9 *ol* 54.6	Cg	J. L. Smith	Am. Jour. Sci. 1877, 3, 14, 226. Mass anal. calc. by Wadsworth
54. Waconda	38.14	1.02	23.44	26.69	tr	1.05	tr	4.64	0.65	0.05	FeS 3.85	tr	MnO 0.47 Li_2O tr Cu tr	100.00	3.50	*ab* 5.2 *ns* 1.1 *tr* 3.9 *hy* 14.9 *nf* 5.3 *ol* 69.7	Ccb	J. L. Smith	Am. Jour. Sci. 1877, 3, 13, 212. Mass anal. calc. by Farrington
55. Bluff	37.70	2.17	23.82	25.94	2.20	....	....	4.41	0.88	0.37	1.30	....	NiO 1.59 P_2O_5 0.25 CoO 0.16 MnO 0.45	101.24	3.51	*an* 6.1 *di* 2.5 *ap* 0.7 *hy* 19.4 *tr* 3.6 *ol* 63.0 *nf* 5.7	Ck	J. E. Whitfield	Am. Jour. Sci. 1888, 3, 36, 119
PERFEMIC, PERSILICIC, PERPOLIC, DOMOLIC, PERMIRLIC, PERMIRIC, MAGNESIFERROUS, KABOSE																			
56. Chateau Renard	38.13	3.82	29.44	17.67	0.14	0.86	0.27	7.70	1.55	....	0.39			99.97	3.56	*or* 1.7 *hy* 24.9 *tr* 1.1 *ab* 7.3 *ol* 52.9 *nf* 9.3 *an* 0.8 *C* 1.7	Cia	A. Dufrenoy	Comptes Rendus, 1841, 13, 47–53
57. Kaba	34.24	5.38	26.20	22.39	0.66	....	0.30	2.88	1.37	tr	FeS 3.55	tr	Chromite 0.89 MnO 0.05 Cu 0.01 C 0.58	98.50	...	*or* 1.7 *hy* 15.0 *cm* 0.9 *an* 3.3 *ol* 65.4 *tr* 3.6 *C* 3.9 *nf* 4.3	K	F. Wohler	Sitzber. Wien. Akad. 1858, 33, 205–209
PERFEMIC, PERSILICIC, PERPOLIC, PEROLIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, KAKOVOSE																			
58. Kakova	37.97	2.27	22.68	24.98	0.69	1.77	0.52	7.15	1.24	0.09	....	0.01	Chromite 0.07 MnO 0.42 Graphite 0.14	100.00	3.38	*or* 2.8 *ns* 1.2 *cm* 0.1 *ab* 9.4 *di* 0.8 *nf* 8.5 *ol* 76.0 *am* 0.9	Cga	E. P. Harris	Chem. Const. Met. 1859, 22–34. Mass anal. calc. by Farrington
PERFEMIC, PERSILICIC, PERPOLIC, PEROLIC, PERMIRLIC, PERMIRIC, MAGNESIFERROUS, JEROMOSE																			
59. Warrenton	35.51	0.13	30.17	25.57	1.43	0.23	....	1.79	0.21	....	FeS 3.51	....	Cr_2O_3 0.06 NiO 1.16 CoO 0.23	100.00	3.47	*ab* 0.5 *ns* 0.2 *cm* 0.2 *di* 5.7 *tr* 3.5 *hy* 1.9 *nf* 2.0 *ol* 85.4	Cco	J. L. Smith	Am. Jour. Sci. 1877, 3, 14, 223. Mass anal. calc. by Farrington
60. Felix	33.57	3.24	26.22	19.74	5.45	0.62	0.14	2.59	0.36	0.08	FeS 4.76	....	Cr_2O_3 0.80 H_2O 0.16 NiO 1.01 CuO 0.01 MnO 0.68 Graphite 0.36	99.79	3.78	*lc* 0.4 *di* 0.2 *cm* 1.1 *ne* 2.8 *ol* 73.4 *tr* 4.8 *an* 5.6 *am* 7.7 *nf* 3.0	Kc	Peter Fireman	Proc. U. S. Nat. Mus. 1901, 24, 193–198
61. Jerome	33.11	1.77	27.97	21.59	1.31	0.65	0.28	3.81	0.43	0.01	1.88	....	Cr_2O_3 0.58 P_2O_5 0.37 NiO 1.77 H_2O 3.03	98.56	3.47	*or* 1.7 *di* 2.3 *cm* 0.9 *ab* 5.8 *ol* 72.7 *ap* 1.0 *an* 1.1 *tr* 5.1 *nf* 4.3	Cck	H. S. Washington	Am. Jour. Sci. 1898, 4, 5, 453

ANALYSES OF STONE METEORITES—*Continued*

PERFEMIC, PERSILICIC, DOPOLIC, PYROLIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, ELWAHOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
62. Eli Elwah	39.47	2.87	17.06	25.58	1.61	0.73	0.11	....	1.01	....	2.30	0.10	Fe_2O_3 9.18	100.02	...	*or* 0.6 *di* 2.9 *mt* 13.5 *ab* 5.8 *hy* 34.6 *tr* 6.3 *an* 4.4 *ol* 29.1 *sc* 0.6 *nf* 1.0	C	A. Liversidge....	Proc. Roy. Soc. New South Wales, 1903, 341–359

PERFEMIC, DOSILICIC, PERPOLIC, PERPYRIC, PERMIRLIC, PERMIRIC, PERMAGNESIC, HVITTISOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
63. Bremervörde	45.40	2.34	4.36	22.40	....	1.18	0.37	21.61	1.89	....	....	....	Chromite 0.31 Graphite 0.14	100.00	3.54	*or* 2.2 *hy* 63.7 *cm* 0.3 *ab* 10.0 *ol* 0.3 *nf* 23.5	Ccb	F. Wohler.......	Ann. Chem. Pharm. 1856, 99, 244–248
64. Hvittis	41.53	1.55	0.34	23.23	1.41	1.26	0.32	24.66	1.96	0.07	3.30	0.08	Cr_2O_3 0.34	100.28	...	*or* 1.7 *ns* 0.9 *cm* 0.9 *ab* 6.8 *di* 5.4 *tr* 9.1 *hy* 52.2 *sc* 0.6 *ol* 2.4 *nf* 20.4	Cek	L. H. Borgström.	Die Meteoriten von Hvittis u. Marjalahti, Helsingiors 1903, 24

PERFEMIC, DOSILICIC, PERPOLIC, PERPYRIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, MOCSOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
65. Mocs	42.74	tr	20.86	15.95	2.78	1.20	0.21	7.93	1.38	tr	2.61	0.41	Chromite 1.56 Mn 0.57 MnO 1.12 Li_2O tr C 0.19	99.51	3.64	*Q* 3.5 *ks* 0.3 *cm* 1.6 *ns* 2.3 *tr* 7.1 *di* 11.3 *sc* 2.6 *hy* 58.8 *nf* 9.9	Cwa	F. Koch........	Min. Mitth. 1883, 2, 5, 243
66. St. Mark's	38.29	0.64	6.50	18.23	1.08	0.85	0.23	26.44	1.84	0.21	5.26	0.05	MnO 0.33 Cl 0.27 Mn 0.29 C 0.36 Ca 0.28	101.15	...	*Q* 1.3 *ns* 1.2 *tr* 14.2 *or* 1.1 *di* 4.5 *sc* 0.4 *ab* 2 1 *hy* 56.0 *oh* 0.2 *nf* 19.4	Ck	E. Cohen.......	Ann. South African Mus. 1906, 5, 1–16

PERFEMIC, DOSILICIC, PERPOLIC, DOPYRIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, CASTALIOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
67. Modoc	44.13	2.47	15.37	26.45	1.74	0.44	tr	6.56	0.68	0.03	1.38	0.05	MnO 0.10	99.40	3.54	*ab* 3.7 *di* 2.9 *tr* 3.8 *an* 5.0 *hy* 47.4 *sc* 0.2 *ol* 28.4 *nf* 7.3	Cwa	Wirt Tassin.....	Am. Jour. Sci. 1906, 4, 21, 359
68. Krähenberg	41.78	0.06	19.53	24.44	1.94	1.00	....	6.31	0.54	....	2.17	....	Chromite 0. MnO tr	98.68	3.50	*ab* 0.5 *ns* 1.8 *tr* 6.1 *di* 7.6 *nf* 6.9 *hy* 47.0 *ol* 26.8	Cho	G. von Rath....	Ann. Phys. Chem. 1869, 137, 328–336. Mass anal. calc. by Wadsworth
69. Bachmut	39.59	2.71	18.81	23.37	0.04	0.63	tr	8.52	1.24	....	2.37	0.05	Chromite 0.79 MnO 0.04 Mn 0.21	98.37	3.56	*ab* 5.2 *hy* 46.2 *cm* 0.8 *C* 1.6 *ol* 26.6 *tr* 6.5 *nf* 10.0	Cw	A. Kuhlberg.....	Archiv. Nat. Liv. Ehst. Kurlands 1867, 1, 4, 132
70. Drake Creek	38.50	4.81	10.03	22.79	0.70	0.59	0.02	12.82	1.50	0.16	1.80	....	Cr_2O_3 1.37 NiO, CuO, SnO_2 2.53 Cu + Sn 0.07	100.00	...	*ab* 5.2 *hy* 43.1 *cm* 2.0 *an* 3.6 *ol* 23.6 *tr* 4.9 *C* 2.5 *nf* 14.6	Cwa	E. H. Baumhauer	Ann. Phys. Chem. 1845, 66, 498–503
71. Castalia	38.50	2.14	13.31	29.83	....	0.55	tr	14.19	0.96	0.06	0.46	tr	Li_2O tr	100.00	...	*ab* 4.7 *hy* 27.5 *tr* 1.2 *C* 1.2 *ol* 49.9 *nf* 15.2	Cgb	J. L. Smith.....	Am. Jour. Sci. 1875, 3, 10, 147–148
72. Dundrum	37.80	0.85	7.92	23.33	1.32	0.96	0.50	19.57	1.03	....	Fe S 4.05	....	Chromite 1.50 MnO 0.16	98.99	3.32	*or* 0.6 *ns* 1.0 *cm* 1.5 *ab* 4.2 *di* 5.1 *tr* 4.1 *hy* 20.8 *nf* 20.6 *ol* 21.4	Ck	S. Haughton....	Proc. Roy. Soc. 1866, 15, 214–217. Mass anal. calc. by Wadsworth
73. Gopalpur	37.44	2.52	11.94	19.72	1.60	0.62	0.21	20.96	1.80	0.10	1.74	....	Cr_2O_3 tr MnO 0.26	98.91		*or* 1.1 *di* 3.6 *tr* 4.8 *ab* 5.2 *hy* 41.9 *nf* 22.9 *an* 3.6 *ol* 15.1	Cc	A. Exner.......	Min. Mitth. 1872, 41–43

ANALYSES OF STONE METEORITES—*Continued*

PERFEMIC, DOSILICIC, PERPOLIC, DOPYRIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, CASTALIOSE—*Continued*

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
74. Adare	37.26	2.03	8.95	13.50	3.61	0.79	0.12	16.24	2.73	0.10	Fe S 6.54	....	Chromite 1.75 MnO 5.50 V tr	99.12	3.93	*or* 0.6 *di* 13.2 *cm* 1.8 *ab* 6.8 *hy* 37.7 *tr* 6.5 *an* 1.7 *ol* 11.8 *nf* 19.1	Cga	R. Apjohn	Jour. Chem. Soc. 1874, 2, 12, 104–106. Mass anal. calc. by Wadsworth
75. Tokeuchimura	36.34	....	14.76	20.91	2.47	1.18	0.28	16.58	1.82	0.05	2.75	0.08	Fe_2O_3 0.36 MnO 0.16 CrO 0.42 NiO 0.30 Chromite 0.95	99.40	3.81	*ks* 0.5 *mt* 0.7 *ns* 2.3 *cm* 1.6 *di* 9.8 *tr* 7.6 *hy* 42.5 *sc* 0.6 *ol* 14.0 *nf* 18.5	Ck	Lindner	Ber. Berlin Akad. 1904, 978–983
76. Ställdalen	35.71	2.11	10.29	23.16	1.61	0.62	0.15	21.10	1.61	0.17	2.27	0.01	Cr_2O_3 0.40 P_2O_5 0.30 NiO 0.20 Cl 0.04 MnO 0.25	100.00	3.74	*or* 0.6 *hy* 41.3 *cm* 0.7 *ab* 5.2 *ol* 20.3 *ap* 0.7 *an* 1.1 *tr* 6.3 *C* 1.0 *nf* 22.9	Cga	G. Lindström	Öfversigt. Kongl. Veten. Forhan. 1877, 35
77. Gnadenfrei	32.11	1.60	14.88	17.03	2.01	0.70	....	25.16	3.92	tr	1.87	....	Cr_2O_3 0.57 MnO tr P_2O_5 tr	99.85	3.71	*ab* 5.8 *di* 7.0 *cm* 0.9 *an* 1.4 *hy* 27.5 *tr* 5.1 *ol* 22.4 *nf* 29.1	Cc	Galle and Lasaulx	Monatsber, Berlin Akad. 1879, 750–771
78. Orgueil	26.08	0.90	15.77	17.00	1.85	2.26	0.19	....	....	....	Fe S 13.43	....	Fe_2O_3 7.78 Chromite 0.49 MnO 0.36 H_2O and org. matter 13.89	100.00	2.50	*or* 1.1 *ns* 3.5 *mt* 11.4 *ab* 3.7 *di* 7.5 *cm* 0.5 *hy* 0.5 *tr* 13.4 *ol* 44.6	K	Pisani	Comptes Rendus 1864, 59, 134

PERFEMIC, DOSILICIC, PERPOLIC, DOPYRIC, PERMIRLIC, PERMIRIC, MAGNESIFERROUS, ENSISHEIMOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
79. Ensisheim	35.65	2.31	34.19	13.13	1.78	0.38	0.22	8.00	1.23	....	2.05	1.01	Cr_2O_3 0.41 MnO 0.21	99.57	3.50	*or* 1.1 *di* 3.9 *cm* 0.7 *ab* 3.1 *hy* 38.8 *tr* 5.6 *an* 4.2 *ol* 25.2 *sc* 6.2 *nf* 9.2	Ckb	F. Crook	Chem. Const. Met. Stones, 21–26

PERFEMIC, DOSILICIC, PERPOLIC, PYROLIC, PERMIRLIC, PERMIRIC, PERMAGNESIC, ORVINIOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
80. Orvinio	37.42	2.27	7.98	22.90	2.32	1.21	0.29	22.23	2.60	....	1.99	....		101.19	3.64	*or* 1.7 *di* 8.7 *tr* 5.5 *ab* 10.0 *hy* 24.6 *nf* 24.8 *an* 0.3 *ol* 24.7	Co	L. Sipöcz	Sitzber. Wien Akad. 1875, 52, 1, 464
81. Klein-Wenden	33.03	3.75	6.90	23.64	2.83	0.28	0.38	23.90	2.37	....	2.09	0.02	Cr_2O_3 0.62 MnO 0.07 Sn 0.08	100.01	3.70	*or* 2.2 *di* 4.8 *cm* 0.9 *ab* 2.1 *hy* 20.9 *tr* 5.8 *an* 8.1 *ol* 27.8 *nf* 26.4	Ck	C. Rammelsberg	Ann. Phys. Chem. 1844, 62, 449–464

PERFEMIC, DOSILICIC, PERPOLIC, PYROLIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, PULTUSKOSE

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
82. Pultusk	41.54	1.17	14.04	26.73	0.28	1.34	....	11.51	0.65	....	0.87	tr	Chromite 0.29 MnO 0.49 Insol. 0.04	99.01	3.66	*ab* 6.3 *ns* 1.2 *cm* 0.3 *di* 1.1 *tr* 2.4 *hy* 38.6 *nf* 12.2 *ol* 36.5	Cga	G. von Rath	Neues Jahrb. Min. 1869, 80–82. Mass anal. calc. by Wadsworth
83. Searsmont	40.82	0.81	13.84	25.99	....	0.85		13.24	1.33	0.06	Fe S 3.06	....	Chromite tr Li_2O tr	100.00	3.70	*ab* .2 *ns* 0.7 *tr* 3.1 *hy* 44.0 *nf* 14.6 *ol* 33.4	Cc	J. L. Smith	Am. Jour. Sci. 1871, 3, 2, 200. Mass anal. calc. by Farrington
84. Rochester	40.77	0.10	16.52	26.47	2.43	0.58	....	9.52	0.42	0.05	Fe S 2.99	....	Chromite 0.15	100.00	3.55	*ab* 0.5 *ns* 1.0 *cm* 0.2 *di* 9.6 *tr* 3.0 *hy* 33.6 *nf* 10.0 *ol* 42.1	Cc	J. L. Smith	Am. Jour. Sci. 1877, 3, 14, 222. Mass anal. calc. by Farrington

ANALYSES OF STONE METEORITES—*Continued*

PERFEMIC, DOSILICIC, PERPOLIC, PYROLIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, PULTUSKOSE—*Continued*

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
85. Dhurmsala	40.69	0.60	11.20	26.59	....	0.39	0.21	6.88	1.54	....	FeS 5.61	....	Chromite 4.16 MnO 1.26	99.13	3.40	*or* 1.1 *ns* 0.2 *cm* 4.2 *ab* 2.1 *hy* 46.9 *tr* 5.6 *ol* 30.4 *nf* 8.4	Ci	S. Haughton	Proc. Roy. Soc. 1866, 15, 214–217. Mass anal. calc. by Wadsworth
86. Richmond	40.37	2.21	13.82	28.33	2.68	....	....	8.22		....	FeS 4.37	....		100.00	3.37	*an* 6.1 *di* 5.6 *tr* 4.4 *hy* 30.2 *nf* 8.2 *ol* 45.5	Cck	C. Rammelsberg	Monatsber. Berlin Akad. 1870, 70, 440
87. Tieschitz	40.23	1.93	19.80	20.55	1.54	1.53	....	10.26	1.31	....	1.65	....		98.80	3.59	*ab* 9.9 *ns* 0.6 *tr* 4.5 *di* 6.3 *nf* 11.6 *hy* 30.9 *ol* 34.1	Cc	J. Habermann	Denkschr. Wien Akad. 1879, 39, 187–201
88. St. Denis-Westrem	40.20	2.54	16.22	25.08	2.00	0.99	tr	10.37	1.24	0.12	2.12	....	Cr_2O_3 0.90 MnO tr	101.78	...	*ab* 8.4 *di* 6.0 *cm* 1.4 *an* 2.5 *hy* 26.7 *tr* 5.8 *ol* 38.3 *nf* 11.7	Cca	C. Klement	Bull. Mus. roy. d'hist. Nat. Belgique 1886, 4, 280
89. St. Christophe	39.33	2.15	13.66	25.90	1.51	0.51	0.18	7.79	1.67	0.11	FeS 6.90	....	Cr_2O_3 0.38	100.09	...	*or* 1.1 *di* 3.8 *cm* 0.9 *ab* 4.2 *hy* 27.9 *tr* 6.9 *an* 3.1 *ol* 42.8 *nf* 9.6	Cg	M. A. Lacroix	Bull. Soc. de'l Onest de la France, 1906, 2, 6, 81–112
90. Tadjera	39.20	1.64	14.18	25.68	2.66	....	....	8.32		....	FeS 8.04	....	Cr_2O_3 0.12	99.84	3.60	*an* 4.5 *di* 6.9 *cm* 0.2 *hy* 33.4 *tr* 8.0 *ol* 38.4 *nf* 8.3	Ct	S. Meunier	Comptes Rendus 1868, 66, 513–519
91. Shelburne	39.19	2.15	15.16	26.24	1.75	0.73	0.22	10.70	0.78	0.04	1.61	0.06	Cr_2O_3 0.62 MnO 0.12	99.37	3.50	*or* 1.1 *di* 4.9 *cm* 0.9 *ab* 5.8 *hy* 25.5 *tr* 4.4 *an* 2.5 *ol* 41.6 *sc* 0.4 *nf* 11.5	Cg	L. H. Borgström	Trans. Roy. Astr. Soc. of Canada 1904
92. Alfianello	39.14	0.93	17.42	25.01	1.96	0.75	0.10	11.31	1.09	....	2.71	....		100.42	...	*or* 0.6 *ns* 0.5 *tr* 7.4 *ab* 4.2 *di* 3.8 *nf* 12.4 *hy* 37.7 *ol* 31.5	Ci	H. von Foullon	Sitzber. Wien Akad. 1883, 88, 1, 433
93. Marion	38.96	2.00	14.52	26.05	1.18	0.38	tr	13.51	1.08	....	2.32	....		100.00	...	*ab* 3.1 *di* 1.5 *tr* 6.3 *an* 3.9 *hy* 41.8 *nf* 14.6 *ol* 28.4	Cwa	C. Rammelsberg	Monatsber. Berlin Akad. 1870, 457–459. Mass anal. calc. by Wadsworth
94. Aussun	38.72	1.85	16.93	22.53	0.80	0.57	0.11	8.63	0.96	....	FeS 3.74	Fe_3P 2.00	Chromite 1.83 MnO tr	98.67	3.54	*or* 0.6 *di* 1.4 *cm* 1.8 *ab* 4.7 *hy* 35.2 *tr* 3.7 *an* 2.2 *ol* 37.3 *sc* 2.0 *nf* 9.6	Cc	H. A. Damour	Comptes Rendus 1859, 49, 31–36
95. Beaver Creek	37.43	2.17	10.49	23.73	1.76	0.80	0.09	15.53	1.51	0.08	FeS 5.05	....	Magnetite 0.16 H_2O 0.29 Chromite 0.30 TiO_2 0.08 NiO 0.03 Cu 0.01 MnO 0.24 P_2O_5 0.25	100.00	...	*or* 0.6 *di* 4.5 *cm* 0.3 *ab* 6.8 *hy* 26.3 *il* 0.2 *an* 2.2 *ol* 36.2 *ap* 0.3 *tr* 5.1 *nf* 17.1	Cck	W. F. Hillebrand	Am. Jour. Sci. 1894, 3, 47, 430. Mass anal. calc. by Farrington
96. Saline	37.08	1.83	18.04	23.34	2.03	0.26	0.08	7.89	0.95	0.04	1.65	0.05	Fe_2O_3 4.45 H_2O 1.23 Cr_2O_3 1.25 NiO 0.74 CoO 0.07	100.99	3.62	*or* 0.6 *di* 5.3 *mt* 6.5 *ab* 2.1 *hy* 32.0 *cm* 2.0 *an* 3.6 *ol* 33.2 *tr* 4.5 *sc* 0.2 *nf* 8.9	Cck	H. W. Nichols and E. W. Tillotson	Private contribution
97. Hessle	36.83	2.38	10.85	23.21	1.80	0.94	....	20.08	2.15	0.02	1.88	0.15	Cr_2O_3 0.07 MnO 0.42 CuO 0.02 Cl 0.04	100.84	3.70	*ab* 7.9 *di* 5.1 *tr* 5.1 *an* 2.5 *hy* 28.8 *sc* 0.8 *ol* 27.3 *nf* 22.3	Cc	G. Lindstrom	Kongl. Svenske. Vet. Ak. 1870
98. Ogi	36.75	1.89	8.84	23.36	1.94	0.97	0.16	15.35	1.75		FeS 5.91	....	Chromite 0.61 Cu + NiO 0.30 Sn 0.15 MnO 0.51 Mn 0.18 P_2O_5 0.34	99.01	...	*or* 1.1 *di* 6.0 *cm* 0.6 *ab* 8.4 *hy* 22.7 *ap* 0.7 *an* 0.3 *ol* 35.0 *tr* 5.9 *nf* 17.4	Cw	T. Shimidzu	Trans. Asiatic Soc. Japan 1882, 10, 199–203
99. Lixna	36.45	2.52	13.16	25.08	tr	0.72	tr	16.95	1.71	....	2.13	0.14	Chromite 0.70 MnO 0.03 Mn 0.43	100.02	3.73	*ab* 5.8 *hy* 39.0 *cm* 0.7 *C* 1.4 *ol* 26.7 *tr* 5.9 *sc* 0.8 *nf* 19.1	Cga	A. Kuhlberg	Archiv. Nat. Liv. Ehst. Kurlands 1867, 1, 4, 1–32

ANALYSES OF STONE METEORITES—*Continued*

PERFEMIC, DOSILICIC, PERPOLIC, PYROLIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, PULTUSKOSE — *Continued*

Name	SiO_2	Al_2O_3	Fe O	Mg O	Ca O	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
100. Salt Lake City...	36.05	1.96	11.70	23.02	1.87	0.85	0.06	15.67	1.38	0.10	Fe S 5.51	....	Chromite 0.62 H_2O 0.94 P_2O_5 0.26	100.00	3.66	*or* 0.6 *di* 4.9 *cm* 0.6 *ab* 7.3 *hy* 22.8 *ap* 0.7 *an* 1.4 *ol* 37.7 *tr* 5.5 *nf* 17.2		S. L. Penfield....	Am. Jour. Sci. 1886, 3, 32, 228
101. Pultusk..........	35.85	1.96	12.12	24.95	1.56	0.95	0.39	15.55	2.21	....	....	....	Fe_2O_3 3.85	99.39	...	*or* 2.2 *ns* 1.1 *mt* 5.5 *ab* 3.1 *di* 6.2 *nf* 17.8 *hy* 21.7 *ol* 40.8	Cga	C. Rammelsberg.	Monatsber. Berlin Akad. 1870, 448–452. Mass anal. calc. by Wadsworth
102. Khetree..........	35.17	1.77	11.16	23.80	2.37	0.87	tr	18.79	1.26	0.21	1.76	0.12	Cr_2O_3 0.40 Cr 0.10	97.78	3.68	*ab* 7.3 *di* 8.4 *cm* 0.7 *an* 1.1 *hy* 20.2 *tr* 4.8 *ol* 33.2 *sc* 0.8 *nf* 20.4	Cgb	D. Waldie......	Jour. Asiat. Soc. Bengal 1869, 38, 2, 252–258
103. Allegan..........	34.95	2.55	8.47	21.99	1.73	0.66	0.23	21.09	1.81	0.15	Fe S 5.05	....	Cr_2O_3 0.53 H_2O 0.25 Ni O tr TiO_2 0.08 Mn O 0.18 Cu 0.01 Li_2O tr P_2O_5 0.27	100.00	3.91	*or* 1.1 *di* 2.4 *cm* 0.7 *ab* 5.8 *hy* 27.7 *il* 0.2 *ol* 29.8 *ap* 0.7 *tr* 5.1 *nf* 23.1	Cco	H. N. Stokes....	Proc. Washington Acad. Sci. 1900, 2, 41

PERFEMIC, DOSILICIC, PERPOLIC, PYROLIC, PERMIRLIC, PERMIRIC, MAGNESIFERROUS, HOMESTEADOSE

Name	SiO_2	Al_2O_3	Fe O	Mg O	Ca O	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
104. Homestead......	36.98	1.18	22.39	18.21	1.39	0.82	0.57	10.27	2.05	....	Fe S 5.25	....	Cr_2O_3 0.49 Mn O 0.25	99.85	3.75	*or* 3.3 *ns* 0.9 *cm* 0.7 *ab* 3.1 *di* 5.7 *tr* 5.3 *hy* 24.8 *nf* 12.3 *ol* 42.1	Cgb	Gümber and Schwager.....	Sitzber. München Akad. 1875, 5, 313–330. Mass anal. calc. by Wadsworth
105. Homestead......	36.92	0.64	22.64	20.02	....	1.42	....	11.17	1.30	0.07	Fe S 5.82	....	Li_2O tr	100.00	3.57	*ab* 3.1 *ns* 2.1 *tr* 5.8 *hy* 34.9 *nf* 12.5 *ol* 41.5	Cgb	J. L. Smith.....	Am. Jour. Sci. 1875, 3, 10, 362. Mass anal. calc. by Farrington

PERFEMIC, DOSILICIC, PERPOLIC, DOPOLIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, FARMINGTONOSE

Name	SiO_2	Al_2O_3	Fe O	Mg O	Ca O	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
106. Lumpkin........	40.73	2.28	14.70	28.10	0.04	1.05	....	6.11	0.84	0.05	Fe S 6.10	....		100.00	3.65	*ab* 8.9 *hy* 26.2 *tr* 6.1 *an* 0.3 *ol* 51.1 *nf* 7.0 *C* 0.5	Cck	J. L. Smith.....	Am. Jour. Sci. 1870, 2, 50, 339. Mass anal. calc. by Farrington
107. Farmington.....	39.95	1.79	15.77	26.16	1.75	0.73	0.11	6.68	0.94	0.06	Fe S 5.00	....	Cr_2O_3 0.58 Ni O 0.32 Cr O tr Mn O 0.16	100.00	...	*or* 0.6 *di* 5.6 *cm* 0.9 *ab* 5.8 *hy* 23.1 *tr* 5.0 *an* 1.7 *ol* 49.7 *nf* 7.7	Cs	L. G. Eakins....	Am. Jour. Sci. 1892, 3, 43, 66. Mass anal. calc. by Farrington
108. Utrecht........	39.30	2.25	15.30	24.37	1.48	1.39	0.15	11.07	1.24		1.90	0.01	Cr_2O_3 0.66 Mn O + Ni O 0.61 Cu O + SnO_2 0.25 Cu + Sn 0.02	100.00	3.61	*or* 1.1 *ns* 0.2 *cm* 0.9 *ab* 11.0 *di* 6.0 *tr* 5.2 *hy* 19.4 *nf* 12.3 *ol* 42.8	Cca	E. H. Baumhauer	Ann. Phys. Chem. 1845, 66, 465–498
109. Aussun.........	38.79	2.27	18.15	25.29	....	1.14	0.18	7.11	1.02	0.06	2.11	....	Cr_2O_3 0.77 Mn O 0.30 Cu + Sn 0.24 Mn 0.04 Fe S 2.53	100.00	3.50	*or* 1.1 *hy* 25.2 *cm* 1.1 *ab* 9.4 *ol* 45.0 *tr* 8.3 *C* 0.3 *nf* 8.5	Cc	E. P. Harris.....	Chem. Const. Meteorites 1859, 44–51. Mass anal. calc. by Farrington
110. Mauerkirchen...	38.14	2.51	25.70	21.73	2.27	1.00	0.48	6.30		....	2.09	0.14	Cr_2O_3 0.39	100.75	3.46	*or* 2.8 *di* 8.2 *tr* 5.5 *ab* 8.4 *hy* 8.5 *sc* 1.0 *an* 1.1 *ol* 57.1 *nf* 6.3 *cm* 0.7	Cw	A. Schwager.....	Sitzber. München Akad. 1878, 8, 16–24
111. Alfianello......	37.63	1.78	24.42	23.43	0.89	1.09	0.24	5.76	1.14	0.08	2.54	0.15	Cr_2O_3 0.10 Mn O 0.13 Cr O_3 0.62	100.00	...	*or* 1.1 *ns* 0.2 *cm* 1.1 *ab* 8.3 *di* 3.6 *sc* 1.0 *hy* 17.3 *tr* 7.0 *ol* 51.9 *nf* 7.0	Ci	P. Maissen......	Gazetta Chemica 1884, 13, 369
112. Blansko........	37.08	2.39	14.95	23.90	1.25	0.74	0.19	16.09	0.87	0.06	0.06	....	Chromite 0.62 Ni O 0.21 Mn O 0.40 Cu + Sn 0.08	98.98	3.40	*or* 1.1 *di* 2.7 *tr* 0.2 *ab* 6.3 *hy* 18.4 *nf* 17.1 *an* 2.8 *ol* 50.5	Cga	J. J. Berzelius...	Ann. Phys. Chem. 1834, 33, 8–25. Mass anal. calc. by von Reichenbach 1865, 124, 213

ANALYSES OF STONE METEORITES—*Continued*

Name	SiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O	Fe	Ni	Co	S	P	Miscellaneous	Sum	Sp. gr.	Norm	Brezina's Symbol	Analyst	Reference
PERFEMIC, DOSILICIC, PERPOLIC, DOMOLIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, FARMINGTONOSE—*Continued*																			
113. Hessle	36.91	1.55	13.43	25.06	2.08	1.57	....	16.36	2.16	tr	0.18	tr	Cu + Sn 0.02 C 0.68	100.00	3.92	*ab* 7.9 *ns* 1.2 *tr* 0.5 *di* 8.5 *nf* 18.5 *hy* 11.8 *ol* 50.9	Cc	A. E. Nordenskjöld	Ann. Phys. Chem 1870, 141, 205–224
114. Buschhof	36.01	2.48	20.98	27.17	0.71	0.26	0.33	7.92	1.51	tr	2.18	0.01	C + SnO_2 + loss 0.15	100.00	3.52	*or* 1.7 *hy* 17.5 *cm* 0.2 *ab* 2.1 *ol* 57.7 *tr* 6.0 *an* 3.6 *nf* 9.4	Cwa	Grewingk and Schmidt	Archiv. Nat. Liv. u. Ehst. Kurlands 1864, 3, 421–554
115. Forest City	35.62	2.08	10.27	23.93	1.40	0.81	0.06	18.08	1.19	0.13	FeS 6.19	tr	Cr_2O_3 0.10 P_2O_5 tr NiO 0.14 MnO tr	100.00	3.64	*or* 0.6 *di* 4.0 *cm* 0.2 *ab* 6.8 *hy* 20.8 *tr* 6.2 *an* 2.0 *ol* 40.2 *nf* 19.4	Ccb	L. G. Eakins	Am. Jour. Sci. 1890, 3, 40, 320. Mass anal. calc. by Farrington
116. Cape Girardeau	35.57	2.27	11.04	23.75	1.38	0.86	0.11	16.46	1.32	0.11	FeS 5.68	....	Chromite 0.68 H_2O 0.47 P_2O_5 0.29 Cu 0.01	100.00	3.67	*or* 0.6 *di* 2.7 *cm* 0.7 *ab* 7.3 *hy* 21.4 *ap* 0.7 *an* 2.0 *ol* 41.4 *tr* 5.7 *nf* 17.0	Cc	S. L. Penfield	Am. Jour. Sci. 1886, 3, 32, 230. Mass anal. calc. by Farrington
117. Heredia	33.10	1.25	16.97	20.39	1.19	0.83	0.04	24.59	1.51	....	....	....		99.87	...	*ab* 6.8 *di* 4.8 *nf* 26.1 *hy* 15.3 *ol* 46.9	Ccb	I. Domeyko	Ann. de la Universitad de Chile 1859, 16, 335–339. Mass anal. calc. by Wadsworth
118. Cabezzo de Mayo	29.29	0.51	5.24	28.00	0.09	0.35	tr	13.66	1.37	....	FeS 20.57	....	Chromite 0.92	100.00	...	*ab* 2.6 *di* 0.4 *cm* 0.9 *hy* 8.0 *tr* 20.6 *ol* 50.4 *nf* 15.0	Cw	S. Meunier	Thèse Faculté des Sciences de Paris, 1869, 9. Mass anal. calc. by Farrington
PERFEMIC, DOSILICIC, PERPOLIC, PEROLIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, ORNANSOSE																			
119. Shytal	32.05	2.54	23.88	22.90	1.12	1.50	0.67	10.38	1.63	....	0.78	0.05	NiO 0.86 Cu 0.11	98.47	3.55	*lc* 3.1 *ns* 0.7 *tr* 2.1 *ne* 5.1 *di* 1.8 *sc* 0.4 *ol* 71.4 *nf* 12.1 *am* 1.2	Cib	T. Hein	Sitzber. Wien Akad. 1866, 54, 2, 558–561
120. Ornans	31.23	4.32	24.71	24.40	2.27	0.55		4.12	1.85	....	2.69	....	Chromite 0.40 NiO 2.88 MnO tr	99.42	3.60	*ab* 2.6 *ol* 69.4 *cm* 0.4 *an* 9.2 *am* 0.8 *tr* 7.4 *mo* 2.3 *nf* 6.0	Cco	F. Pisani	Comptes Rendus, 1868, 67, 663–665
121. Cold Bokkeveld	30.80	2.05	29.94	22.20	1.70	1.23		2.50	....	tr	3.38	....	Cr_2O_3 0.76 CuO 0.03 NiO 1.30 C 1.67 MnO 0.97 Bit. 0.25	98.78	2.69	*ne* 5.7 *di* 1.1 *cm* 1.1 *an* 0.3 *ol* 72.5 *tr* 9.2 *am* 1.1 *nf* 2.5	K	E. P. Harris	Sitzber. Wien Akad. 1859, 35, 512
122. Mount Vernon	22.95	0.27	13.20	26.68	....	....	....	27.66	4.71	0.32	FeS 0.69	Fe_3P 1.95	Fe_2O_3 0.11 Cu 0.03 Chromite 1.00 Graphite 0.09 NiO 0.13 Al 0.12 MnO 0.09	100.00	...	*C* 0.3 *ol* 58.9 *mt* 0.2 *mo* 4.1 *cm* 1.0 *tr* 0.7 *sc* 2.0 *nf* 32.8	P	Wirt Tassin	Proc. U. S. Nat. Mus. 1905, 28, 213–217. Mass anal. calc. by Farrington
PERFEMIC, DOMETALLIC, PERPOLIC, PERPYRIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, STEINBACHOSE																			
123. Steinbach	27.47	0.68	3.49	8.48	0.70	0.48	....	45.71	4.95	0.12	FeS 7.22	0.07	Chromite 0.32 MnO 0.16 Schreibersite 0.15	100.00	...	*Q* 8.7 *ns* 1.2 *cm* 0.3 *ab* 3.7 *di* 2.0 *sc* 0.8 *hy* 25.8 *tr* 7.22 *nf* 50.8	S	Winkler	Nova Acta. der K. Leop. Carol. deutsch Akad. 1878, 40. Mass anal. calc. by Farrington
PERFEMIC, DOMETALLIC, PERPOLIC, DOPYRIC, PERMIRLIC, PERMIRIC, DOMAGNESIC, MINCIOSE																			
124. Mincy	20.64	3.55	8.88	8.08	2.71	....	....	49.18	5.73	0.16	FeS 0.99	0.08		100.00	4.84	*an* 9.7 *di* 3.0 *tr* 1.0 *hy* 21.5 *sc* 0.6 *ol* 9.0 *nf* 55.1	M	J. E. Whitfield	Am. Jour. Sci. 1887, 3, 34, 468–469. Mass anal. calc. by Farrington
PERFEMIC, DOMETALLIC, PERPOLIC, PEROLIC, PERMIRLIC, PERMIRIC, PERMAGNESIC, MARJALAHTOSE																			
125. Marjalahti	8.07	....	2.38	9.47	....	0.04	0.01	73.95	5.71	0.34	....	....	Cr_2O_3 0.03	100.00	...	*ol* 20.0 *nf* 80.0	P	L. H. Borgström	Die Met. von Hvittis u. Marjalahti, Helsingfors 1903, 57. Mass anal. calc. by Farrington

ADDITIONAL ANALYSES OF IRON METEORITES

The following analyses of iron meteorites have been made since the writer's compilation (Pubs. Field Museum Geol. Ser. 1907, 3, 59-110) or were overlooked in making that compilation.

COARSE OCTAHEDRITES

Name	Fe	Ni	Co	Cu	Cr	P	S	C	Si	Cl	Insol	Miscellaneous	Total	Sp. gr.	Analyst	Reference
Bohumilitz	90.77	7.72	1.22	....	....	....	....	....	....	....	....		99.71	...	O. Koestler	1891, A. N. H. Wien, 6, 144
Cosby $\frac{2}{2}$	89.72	10.12	0.42	....	....	0.11	tr	....	....	....	....		100.37	...	R. v. Reichenbach	1861, Pogg. Ann. 94, 250
Nuleri	93.57	5.79	0.41	tr	....	0.13	tr	0.01	....	tr	....	Sn 0.04 FeO + SiO_2 1.32 Graphite 0.19	100.00	7.79	E. S. Simpson	1907, Bull. Geol. Survey, W. Australia, 26, 24–26
Wichita	90.77	8.34	0.26	0.02	....	0.14	0.02	....	....	....	..		99.88	...	J. W. Mallett	1884, A. J. S. 3, 28, 287
Wichita	91.39	7.91	0.40	tr	....	....	....	....	....	....	..		99.70	...	Cohen and Weinschenk	1891, A. N. H. Wien, 6, 153
Wichita	92.37	6.74	0.59	0.03	....	0.03	....	....	....	....	..		99.76	...	Manteuffel	1892, A. N. H. Wien, 7, 155

MEDIUM OCTAHEDRITES

Name	Fe	Ni	Co	Cu	Cr	P	S	C	Si	Cl	Insol	Miscellaneous	Total	Sp. gr.	Analyst	Reference
Ivanpah	91.12	6.92	1.73	....	....	....	....	....	....	....	....		99.77	...	O. Koestler	1891, A. N. H. Wien, 6, 145
Ivanpah	92.68	7.43	0.66	0.01	....	0.03	....	....	....	....	....		100.81	...	Manteuffel	1892, A. N. H. Wien, 6, 149
Inca	90.73	8.20	0.22	....	0.35	0.23	tr	0.24	....	....	....		99.97	7.64	Halbach	1907, Neues Jahrb. Festband. 230
Ilimäe	91.53	7.14	0.41	tr	....	0.44	....	....	....	....	....		99.52	...	C. Ludwig	1871, Sitzb. Wien Akad. 194
Joe Wright	91.67	7.53	0.99	....	....	tr	....	....	....	....	....		100.19	...	Cohen and Weinschenk	1891, A. N. H. Wien, 6, 158
Rancho de la Pila	91.78	8.35	0.01	....	....	tr	....	tr	....	....	....		100.14	...	Janke	1884, Beitr. Abh. natur. Ver. Bremen, 8, 517
Tanokami	90.11	8.56	0.62	....	....	0.43	....	....	....	....	....		99.95	7.60	Kodera	1906, Beitr. z. Min. Japan, 2, 30–52
Williamstown	91.54	7.26	0.52	0.03	0.05	0.12	0.17	tr	tr	....	....		99.69	8.10	W. Tassin	1908, A. J. S. 4, 25, 49–50

FINE OCTAHEDRITES

Name	Fe	Ni	Co	Cu	Cr	P	S	C	Si	Cl	Insol	Miscellaneous	Total	Sp. gr.	Analyst	Reference
Muonionalusta	91.10	8.02	0.69	0.01	0.01	0.05	....	....	....	....	....		99.88	7.89	R. Mauzelius	1909, Bull. Geol. Inst. Univ. Upsala, 9, 236

BRECCIATED OCTAHEDRITES

Name	Fe	Ni	Co	Cu	Cr	P	S	C	Si	Cl	Insol	Miscellaneous	Total	Sp. gr.	Analyst	Reference
Ainsworth	92.22	6.49	0.42	0.01	0.01	0.28	0.07	0.09	0.05	....	....		99.64	7.85	W. Tassin	1908, A. J. S. 4, 25, 107

ATAXITES

Name	Fe	Ni	Co	Cu	Cr	P	S	C	Si	Cl	Insol	Miscellaneous	Total	Sp. gr.	Analyst	Reference
Guffey	88.69	10.55	....	....	0.02	0.02	0.02	0.02	....	....	....		99.87	7.94	Booth, Garrett and Blair	1909, Am. Mus. Jour. 9, 243
Weaver	81.81	16.63	1.18	....	....	tr	tr	....	....	....	....	Mn tr	99.62	7.99	F. Hawley	1910, Mineralogy of Arizona, 22
Weaver	79.60	18.80	1.60	....	....	tr	tr	....	....	....	....	Mn tr	100.00	7.98	W. B. Alexander	Same